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THE SMOKE QUESTION.

The emission of smoke from steam locomotives, factory and power-plant chimneys, and the like, has long been a recognized evil, and latterly the abatement of this nuisance has become a question of paramount importance. The pall of smoke over a city shuts out the sunlight and causes much sickness and depression. It blackens and corrodes the exteriors of buildings and deteriorates the interior furnishings, thus entailing much additional expense for their upkeep. In the vicinity of smelters the smoke and fumes destroy the crops. In short, smoke is an unmitigated nuisance and should be abolished as far as possible.

Most of the smoke emitted from chimneys is due to the burning of "soft" or bituminous coals. These coals contain a large amount of readily volatilizable matter, and it is from this mainly that the smoke is due. "Hard" coal, or anthracite, contains but little volatile matter, and consequently emits little or no smoke when burnt. But anthracite is generally expensive, and in most places, except in those localities in which it is mined, its cost is prohibitive. Therefore, most factories and power plants, especially in the western parts of this country, are reduced to the necessity of burning semibituminous, bituminous, and lignitic coals. Thus, the question arises, is smoke preventable? The answer is given unqualifiedly, it is.

In many districts laws have been passed to prevent factories from belching forth huge volumes of black smoke, but the general result has not been altogether satisfactory. Many manufacturers have preferred to pay small fines from time to time rather than go to the expense of remodeling their plants; and again it has been found difficult in some places to convince magistrates that it was a good thing to penalize the owners and operators of factories and power plants to whom was due in no small measure the prosperity of the surrounding district. Legislation will accomplish much, however, if solidly backed by public opinion. This latter is the deciding factor, as witness the present agitation in Chicago in the matter of railroad electrification.

The whole question of smoke prevention resolves itself into two essentials. These are: (1) Efficient firing and stoking; (2) proper draft.

More than 100 years ago James Watt laid down the correct principles for burning bituminous coal. This fuel should be burnt on the coking system. In the practical operation of this system the fresh coal should be placed on front of the fire on the furnace deadplate so that the volatile portions may first

be driven off and burnt further back in the furnace. Then this partly coked coal must be pushed back on the grate and replaced by a further supply of green fuel on the deadplate. Air must be supplied not only under the grate but also above the grate to insure the complete combustion of the volatile products from the fresh coal. This is without a doubt the only proper method to follow in dealing with bituminous fuel, and it is unquestionably superior to the so-called sprinkling system. These principles may sound elementary. In truth they are quite well known. But their importance cannot be emphasized too strongly.

The question of proper draft is one which cannot be given too much prominence, and herein lies the opportunity for the skilled investigator. Whether the draft be effected by the aid of a cumbersome expensive chimney, or whether some method of mechanical draft be employed, the general principles to be observed are much the same. After the boiler and its accessories are correctly designed and manufactured, the greatest skill and attention must be used in their proper installation. Finally, the fireman or attendant must be well versed in his calling to insure good results in operation. Too little air will cause smoke and consequent lack of efficiency. Entire absence of smoke on the other hand does not necessarily mean correct draft; there may be too much air, with resulting inefficiency. More discussion on this point will be found in an article on "Mechanical Draft" in another part of this issue. Without a doubt the chief element in a hand-fired plant is the fireman or firemen. With well-designed mechanical stokers and proper precautions for draft regulation the question of efficient firemen is not so urgent, but even with automatic stokers efficient attendance is an absolute indispensability.

Turning to the problem at large, other remedies in addition to the above might be suggested. The electrification of railroads will contribute in great measure, of course, toward smoke abatement. But the railroads are not the only offenders. Smoke prevention in existing plants cannot be too strongly emphasized. Anything that may be done on a large scale can, as a rule, be done much cheaper and more effectively than in a number of isolated cases. This immediately suggests the centralization of power distribution and the abolition of the isolated plants with their separate chimney stacks distributed all over the community. Meanwhile it behooves the operators of existing central stations so to improve their plants as to point the moral.

Municipal or even state legislation might also be effected and enforced; but in drafting proper reforms it would be well to call engineers and plant operators into consultation. Even without such universal action, or at least until it comes to pass, as eventually it must, operators of individual plants can of themselves do much to banish the smoke evil by observing elementary precautions, and the sooner they realize that smoke means inefficiency and waste, in every sense and in all aspects of the situation, the sooner will something be done in the matter.

In conclusion, attention is drawn to another article in this present issue, entitled "Industrial Smoke Prevention in Hamburg," wherein is given some excellent information by which all can profit who have to do with the care or operation of steam boilers.

THE RIGHT TO FRANCHISE VALUE.

Where public-service properties such as bridges, dams, waterworks and electric plants have been taken by eminent domain, the courts have upheld the right to payment for the franchise value as well as that of the structures themselves.

In estimating the values of such franchises the earnings resulting from their use have repeatedly been indicated as the most important factor. Under the general rule in eminent domain, the earnings of tangible property taken cannot be shown in evidence to enhance its value, but earnings that result from the use of a franchise are admitted for its valuation.

One of the earlier cases, where it was held that the owner of a public-service structure is entitled to the value of the franchise when the structure is taken by public authority, involved a toll bridge over the Schuylkill River that was taken by Montgomery County. The contention of the county in this case was that compensation to the bridge company was to be measured merely by the cost of building a new bridge, but the opinion of the court on this point was as follows:

"The bridge structure, the stone, iron and wood, was but a portion of the property owned by the bridge company, and taken by the county. There were the franchises of the company, including the right to take toll, and these were as effectively taken as the bridge itself. Hence, to measure the damages by the mere cost of building the bridge would be to deprive the company of any compensation for the destruction of its franchises. The latter can no more be taken without compensation than can its tangible corporeal property."

As to the method of estimating the value of the bridge franchises the opinion ran thus in the above case:

"Their value necessarily depends on their productiveness. If they yield no money in return over expenditures, they would possess little, if any, present value. If, however, they yield a revenue over and above expenses, they possess a present value, the amount of which depends, in a measure, upon the excess of revenue. Hence it is manifest, that the income from the bridge was a necessary and proper subject for inquiry before the jury." Montgomery County *vs.* Schuylkill Bridge Company, 110 Pa. State 54. Decided 1885.

Even in a case where Congress provided that a lock and dam belonging to a private corporation should be taken in the interest of navigation and that no compensation should be made for the franchise of the corporation to take toll, it was held by the Supreme Court of the United States that compensation for this franchise must be made. On this point Justice Brewer said:

"We are not, therefore, concluded by the declaration in the Act that the franchise to collect tolls is not to be considered in estimating the sum to be paid for the property. * * * * If a man's house must be taken, that must be paid for; and, if

the property is held and improved under a franchise from the state, with power to take tolls, that franchise must be paid for, because it is a substantial element in the value of the property taken. So, coming to the case before us, while the power of Congress to take this property is unquestionable, yet the power to take is subject to the constitutional limitation of just compensation. * * * * How shall just compensation for this lock and dam be determined? * * * * The value of property, generally speaking, is determined by its productiveness, the profits which its use brings to the owners. * * * * The value, therefore, is not determined by the mere cost of construction, but more by what the completed structure brings in the way of earnings to its owner. * * * * The prices which may be exacted under this legislative grant of authority are the tolls, and these tolls, in the nature of the case, must enter into and largely determine the matter of value." Monongahela Company *vs.* United States, 148 United States 312.

A later case in the Supreme Court of the United States shows how valuable a public-service franchise may come to be in comparison with the tangible property by means of which it is used. In this case the city of Brooklyn took the plant, property and franchises of a water-supply company, and the commissioners appointed to value these items awarded the sum of $370,000 for the tangible property of the company, and $200,000 for its franchises and contracts. The basis of franchise valuation was stated as follows, and this was sustained:

"To recapitulate what has just been said, we have valued the franchise upon the assumptions (1) that at present the water company alone has the right publicly to purvey water in the Twenty-sixth Ward; (2) that the exclusiveness now incident to its right may at any time be taken from it by the Legislature, or by local authorities acting under legislation; but (3) that neither the Legislature nor local authorities would, in determining whether to take from the company the exclusiveness of its right, fail to have such due regard as is demanded by ample and fair public policy, to the past investment, risks and services of the company and to the reasonably just expectations which those who have invested money in its work had in mind when so investing." Long Island Water Supply Company *vs.* Brooklyn, 166 United States 685.

COMPARATIVE POWER COSTS IN TWO TURBINE STATIONS.

The results of the first year of operation in two recently completed steam-turbine central stations furnish data of suggestive emphasis upon the importance of cultivating a large day load. The plants are seventy-five miles apart, but each is located in a city where the textile industry is the chief source of occupation of the community. Each station illustrates the best skill of experienced organizations frequently occupied in designing new and efficient plants. The same make of generating units is used in each case, direct-connected to the same kind of turbines. In one city, however, the power business has never been developed much beyond the natural unsolicited demand of the community, while in the other instance all the resources of a progressive, commercial management have been successfully employed to create a first-class motor load. In the first case, which may be called that of plant A, the only competition which the company faces in the power field is that of the isolated plant, burning coal under much less favorable conditions than the central-station organization has to meet. Plant B, on the other hand, has to fight against waterpower facilities of long-established usefulness in the community, and yet its power business has become sixty-one per cent of the total kilowatt-hour sales, compared with a power business of 20.2 per cent in plant A.

The equipment of plant A consists of one 500-kilowatt and two 1,000-kilowatt Curtis turbines delivering current to the system at 2,300 volts, with steam supplied from four Babcock & Wilcox water-tube boilers of 350-horsepower each, at 165 pounds pressure. The auxiliaries are motor-driven and the equipment is thoroughly representative of good practice in type and arrangement. The station of Company B is equipped with one 1,500-kilowatt Curtis turbine, and on an adjoining portion of the property, with 4,700 horsepower in seven condensing engines and generators of assorted character. The old plant is being displaced as fast as possible by the new station, which is designed for an expansion capable of meeting the demands of many years to come. The old boiler plant is equipped with thirteen Scannel horizontal return tubular units of 1,651 horsepower rating, total, and the new station with three Stirling boilers of 1,578 horsepower rating, operating at 180 pounds each. The division of the load between the old and new portions of the plant is not stated, but from the results obtained and the character of the old equipment it appears that the larger part of the work was done by the turbine installation.

The cost of coal in plant A was $3.83 per ton, and in plant B $4.35. The station with the good power load thus suffered a disadvantage in the fundamental factor of power production, being obliged to handle its coal by rail while the other company utilized tide water. Bituminous coal of New River quality was used by each station. The operating results at the switchboard were a total manufacturing cost of 1.12 cent per kilowatt-hour in plant A and 0.94 cent in plant B. The fuel cost per unit of output was 0.53 cent in plant A and 0.63 cent in plant B. The station wages cost per kilowatt-hour was 0.35 cent in A and 0.24 cent in B. The total cost of production at the switchboard was about $47,100 in plant A and $94,400 in station B. The total energy generated was 4,226,887 kilowatt-hours in station A and 10,042,010 kilowatt-hours in B. The power sales were 648,234 and 4,705,934 kilowatt-hours, respectively.

It is probable that when the old equipment is entirely superseded by the turbine outfit in plant B, a further gain in economy will result, but the figures here presented show with unmistakable emphasis the value of gross energy sales and gross station output in reducing the unit cost of production.

The New York Electrical Show.

The third annual New York Electrical Show, which was opened at Madison Square Garden on the evening of October 11, was the most successful exhibition of this kind that has ever been held in New York city. The show was open every day and evening, and closed with a great demonstration on October 21. Both the lighting and general decorative scheme have been carried out on such a magnificent scale as has never been seen in this well-known auditorium. Throughout the structure there was a prevailing note of harmony in the arrangement of the booths, the illumination, and all features that attract the eye. The great roof of the Garden was successfully draped with a mass of soft gold and white bunting, which was continued over the walls of the building and its balcony.

The illumination of the ceiling was carried out by a large number of beautiful electroliers carrying colored lights. Liberal use was made of tungsten lamps for this purpose, both of the twenty-five-watt and forty-watt sizes. The arrangement of the booths and the general effect is well shown by the accompanying pictures. The decorative scheme was designed by M. A. Singer. It has elicited admiration from all the visitors to the show, who declared that it was an unqualified artistic success.

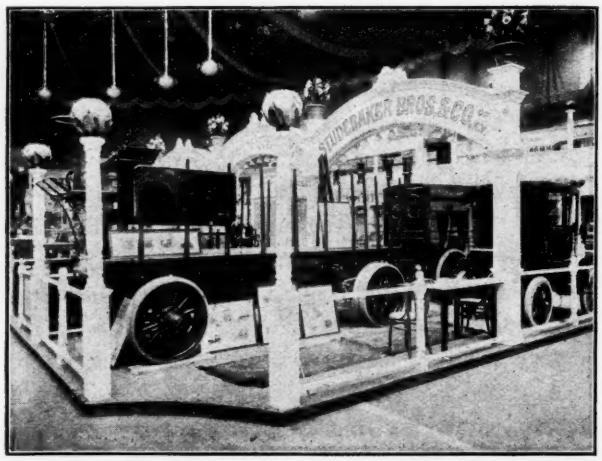
The exhibits at the show, although not bringing out much that was absolutely novel, were, as might be expected, of a character to appeal particularly to the multitude and to show the advantages of the use of electricity both in the home and factory. There was a larger display of motor-driven devices than heretofore, but the matter of electric lighting and domestic applications still predominated.

Excellent displays were made by the four electric-lighting companies in the New York district. The exhibits of the New York Edison Company, the United Electric Light and Power Company, the Edison Electric Illuminating Company of Brooklyn, and the Public Service Corporation of New Jersey were along the lines of popularizing the electric current in every conceivable manner. The exhibits of the three former companies, which were quite extensive, were located along the sides and rear of the Garden.

A concerted effort was made by the most representative manufacturers of electrical devices to make a fine display of their products in the central booths of the show. The balcony was given over principally to the display of electric irons and other household electrical utilities.

During the progress of the show many special events took place and several large social gatherings were held. On Tuesday evening, October 19, the New York Edison Company tendered an entertainment and smoker to the electrical contractors of New York city, in the concert hall of the Madison Square Garden and on the closing night, October 21, the Sons of Jove were scheduled to hold a rejuvenation.

Westinghouse Electric and Manufacturing Company.



Studebaker Brothers & Company.

Charles L. Kiewert Company.

Excello Arc Lamp Company.

SOME PROMINENT BOOTHS AT THE NEW YORK ELECTRICAL SHOW.

On each afternoon and evening throughout the show an excellent musical programme was rendered by d'Aquin's Military Band.

Following are brief descriptions of the exhibits made by the various exhibiting companies and firms:

The New York Edison Company space covered the entire length of the Garden along the north side of the building, and attracted probably more attention than any other exhibit. It was primarily an exhibition of the advantages of electric power for industrial purposes. Here demonstrations of motor-driven industrial machinery of various sorts were made by skilled operators. There were included a number of printing presses, sufficient for a good sized print shop, all in operation; cigarette making and candy making equipments; a complete electric laundry; an electric chicken incubator, which attracted general interest; and many other electrical applications.

The exhibit of the United Electric Light and Power Company extended along the entire south side of the Garden and showed a great variety of interesting applications of alternating current for lighting and power purposes. There were exhibited a number of spectacular novelties, medical and dental apparatus, household devices; all kinds of electric incandescent, arc and vacuum lamps; store, factory and building construction motor-driven machines. Making displays of their products in this space were the following companies: Stow Manufacturing Company, electric buffer and breast drill; Lincoln Electric Company, motor and motor-generator set; Cooper-Hewitt Electric Company, mercury-vapor lamp; Adams-Bagnall Electric Company, an A-B regenerative flame arc lamp and a standard A-B enclosed arc lamp; J. H. Hallberg, stereoptical outfit and moving-picture exhibit; A. A. Automatic Manufacturing Company, showing an A. A. automatic kitchen.

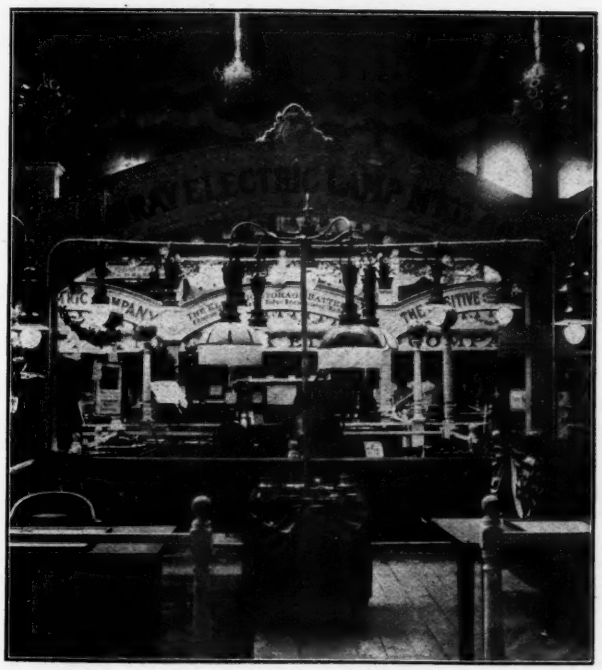
The Edison Electric Illuminating Company, of Brooklyn, in a series of booths which occupied the entire eastern end of the building, had a very handsome and extensive working display of electric lighting, heating and small motor appliances, particularly adapted for use in the various branches of household economy. The exhibit of cooking utensils was particularly complete, as was also that of labor-saving kitchen and laundry appliances.

The booth of the Public Service Corporation of New Jersey faced the main entrance and was used principally as a reception room. A number of maps and photographs showing the great system of the company were in evidence.

The Excello Arc Lamp Company, of New York, had a display of its various types of flaming arc lamps, both for direct-current and alternating-current circuits. One set comprised four lamps suitable for operation in series on 220-volt alternating current. An interesting feature was the first quartz lamp that has been shown in America. A number of Excello

General Electric Company.

National Electric Lamp Association.



Sunray Electric Lamp Manufacturing Company.

Otis Elevator Company.

CONSPICUOUS EXHIBITS AT THE NEW YORK ELECTRICAL SHOW.

flaming arc lamps were in use in other booths, and eight of these arcs were used for lighting up the arcade at the Madison Avenue entrance to the Garden. On the evening of October 18 this company made a great "hit" by sending up a balloon from the roof of the Garden to a height of about 1,000 feet. Hanging a short distance below the balloon were twelve Excello flaming arc lamps arranged in a circle and burning brilliantly. This created a great deal of favorable comment.

The Empire Vacuum Cleaner Company, of New York, made a fine display of its Imperial cleaner.

The German-American Electric Company, of New York, showed a number of the Grant flaming arc lamps and Grant tungsten lamps in operation. A number of automatic lamp suspension devices were also exhibited.

The Manhattan Electrical Supply Company, of New York, showed an extensive line of general supplies. Included were: Electric light specialties, telegraph and telephone sets, medical apparatus, massage vibrators, jump spark coils, door openers, etc. The wireless telegraph equipment was also shown in operation at two stations in the Garden.

The Como Electrical Company, of Spring Lake, N. J., had on exhibition a number of Hickley electrolytic, alternating-current rectifiers. The company builds rectifiers of various types, the largest type being intended for charging a twenty-four-cell vehicle battery, another type is intended for garage use in connection with six six-volt batteries on a 110-volt alternating-current line. Several smaller types suitable for charging batteries or for running small motors, such as are used in railroad signal work, were displayed. These rectifiers, it is claimed, will operate on any frequency from ten to 133 cycles and at any voltage up to 1,000.

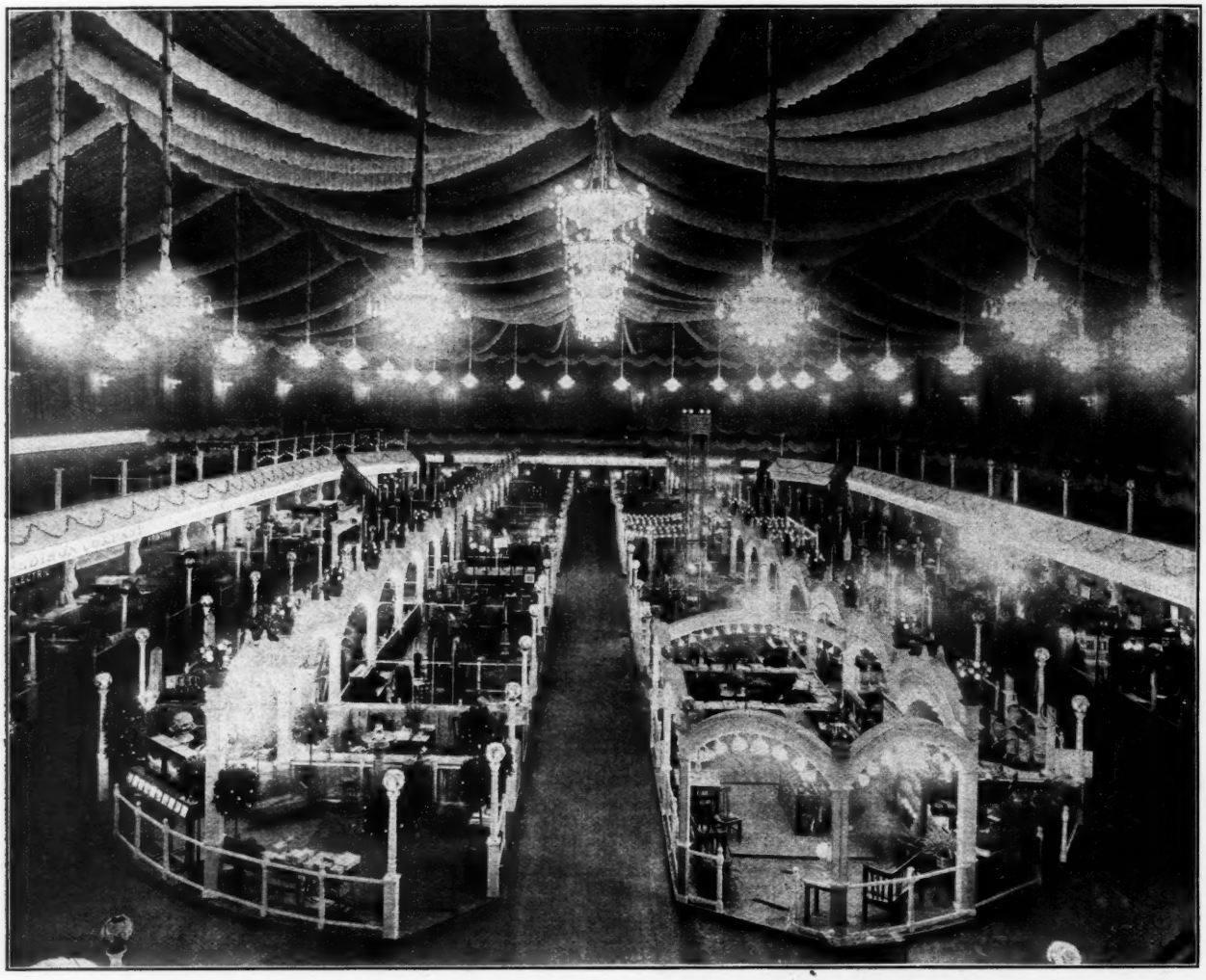
The General Electric Vehicle Company, of Long Island City, N. Y., had on display two electric vehicles—one of which was an electric light company's delivery wagon of 1,000 pounds capacity, and the other a wagon of express-body type of 2,000 pounds capacity. It was said these vehicles could run fifty miles on a charge at an average speed of ten miles per hour. The company also makes vehicles for any capacity and any class of commercial service.

The American Metal Hose Company, of New York city, occupied a booth on the gallery and showed flexible metal conduits in steel, brass and copper, suitable for cord for window lighting; flexible metal conduit, waterproof, for underground work; flexible metal hose for highest steam pressures, oil, compressed air; seamless flexible copper hose for gasoline, flexible metal hose to stand a pressure up to 10,000 pounds per square inch; flexible arms for electric-light fixtures, etc.

The Electric Cleaner Company, of Chicago, showed an extensive line of portable electric vacuum cleaners known as the "Positive" and the "Reliable." Both these types of machines were demonstrated by the company's representatives, who explained all their features with care.

Dossert & Company, of New York, exhibited a complete line of solderless connectors, cable taps and terminals for electric cables and wires. A new feature was a cable tap for connecting aluminum and copper cables. This tap gives an aluminum contact at the point of connection with the aluminum cable and a copper contact at the point of connection with the copper cable. The method of making rapid transformer connections with Dossert connectors was also shown.

The Baltimore Enamel and Novelty Company, of New York, showed porcelain-enameled-iron reflectors for arc lamps



GENERAL VIEW OF THE THIRD ANNUAL NEW YORK ELECTRICAL SHOW.

and incandescent lamps; battery jars and other porcelain products were also shown.

The Lansden Company, of Newark, N. J., exhibited two of its electric vehicles, representing widely different lines of construction; one was a standard 1500-pound closed panel delivery wagon, the other was an industrial truck, which has been developed for use in factories, mill yards, steamship piers, railroad terminals, etc. The vehicle is said to possess features which make it particularly applicable for such work. It is low and easily loaded, and on account of its peculiar construction can be maneuvered through narrow passageways. The machine is constructed either as a three-wheel or four-wheel truck.

The Electric Storage Battery Company, of Philadelphia, showed an element of type H-131 Exide battery, as installed at the Sixteenth Street station of the New York Edison Company; nine standard sets of vehicle batteries; Exide sparking duplex and emergency sparking batteries; car-lighting batteries; automobile electric head lamps operated by Exide sparking batteries; and a casting mold electrically operated for casting souvenirs consisting of lead disks bearing the imprint of the company.

The Electric Home Supply Company, of New York, exhibited goods made by the Vulcan Electric Heating Company, of Chicago, manufacturers of soldering and branding coppers, can sealing devices and the "electrocurl" which is an electrically-heated curling iron. The company also exhibited the products of the Dielite Manufacturing Company, of Philadelphia, Pa., manufacturer of "Dim-a-lite" regulating sockets. Wirt regulating rheostats and dimmers, as well as the Dielite insulating joints. A feature of the exhibit was a ten-room, completely equipped and electrically lighted doll house and a case containing an electric cooking outfit, intended for a child.

The Goulds Manufacturing Company, of New York, had as the chief feature of its exhibit a single-acting triplex-power plunger pump mounted on a bedplate with an adjustable belt idler and belt connected to a 220-volt, three-fourths horsepower Crocker-Wheeler motor.

The International Correspondence Schools, of Scranton, Pa., showed bound volumes of their numerous engineering courses and specimens of students' work.

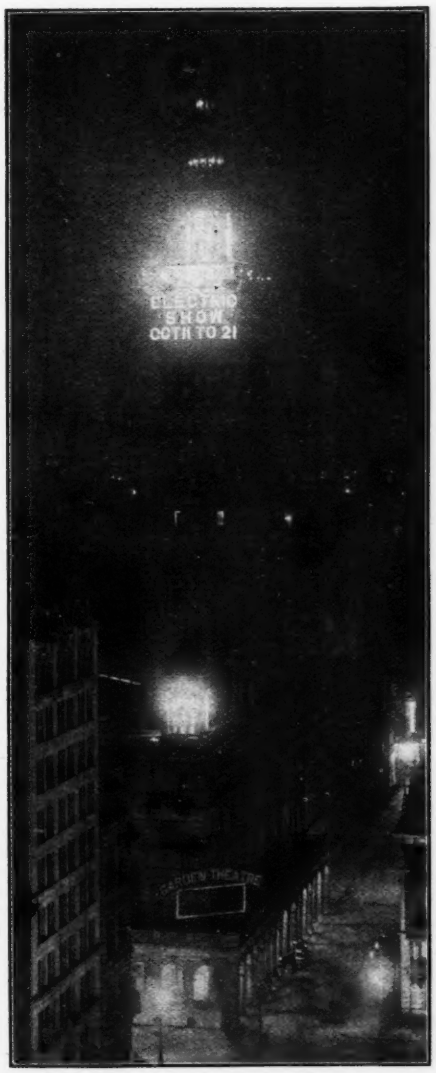
The Crane Company, of Chicago, showed a number of electrically operated gate valves, cast-steel valves and headers and an operating exhibit of the "Crane-tilt" steam traps.

Hoover Suction Sweeper Company, of New Berlin, Ohio, had a number of its vacuum sweepers in operation.

The General Compressed Air and Vacuum Machine Company, of St. Louis, exhibited a number of Thurman portable electric vacuum cleaners.

The Storage Battery Supply Company, of New York, showed its Hudson-Fulton storage battery intended for Christmas-tree outfits and similar uses. Battery testing appliances, etc., were also shown.

The Studebaker Brothers Automobile Company, of New York, placed on exhibition three representative 1909 electric vehicles. One was a coupé, combining all the latest features of control and refinement in the manufacture of pleasure vehicles. Another was a panel body delivery wagon representative of the type of vehicle which is in general use by large retail stores, such as Rogers-Peet and Oppenheim-Collins, in New York city. There was also shown a five-ton stake truck which is the largest of this complete line



EXTERIOR LIGHTING OF MADISON SQUARE GARDEN FOR ELECTRICAL SHOW.

of commercial vehicles, and which are taking the place of two or three-horse-drawn vehicles each, and thereby producing great increase in transportation economy.

The General Electric Company's booth was in the central part of the Garden. The exhibit included displays of the latest developments in heating apparatus and tungsten and tantalum lamps, including a case of miniature and sign lamps. Ten of the most attractive designs in copper and silver, of the line of S. Sterneau & Company's chafing-dishes, teakettles and coffee percolators equipped with the G. E. encased disk universal heating elements, elicited very favorable comment, and gave promise of an excellent "Electrical Christmas" trade. A new line of soldering irons embodying the spiral wire handle idea marked an innovation in cool flexible handles and removable tips in soldering tools. Other new heating devices were the solder melting pot, sealing-wax heater, automatic flatiron, "cast in" unit frying pan and teakettle, and foot-warmer. There was also shown a line of flaming arc lamps, intensified arc lamps and a multiple automatic cut-out hanger, with rope suspension. An interesting feature was the motor-driven braiding machine in operation, showing the method of making cord for G. E. heating devices. In the center of the booth were General Electric motors operating Ingersoll-Rand drills and the Bridgeport Safety Wheel Company's grinder. A line of small motors not in operation permitted close inspection. A complete line of fan motors, rheostats, compensator panels, circuit-breakers, meters and instruments was shown; also a multiple rectifier, a 10,000-volt lightning arrester and a display of automobile accessories.

The Moore Electrical Company, of Newark, N. J., had, besides the permanent installation of a yellow tube in the lobby of the Garden, a small white light unit used for color-matching work and the sorting and selection of precious stones, especially diamonds. This unit, which operates on 220 volts, sixty cycles, is semi-portable and is claimed to give uniformly accurate results as a duplication of average diffused daylight.

The exhibit of the Westinghouse Electric and Manufacturing Company was representative of the complete line of small-power motors and electrical heating apparatus, intended for domestic use, manufactured by this company, omitting the extensive and well-known products of electrical machinery for lighting, power and traction. Among the electrical heating devices were shown the new Westinghouse toaster stove, steel-top hot plate, flatirons, tailor irons and luminous and non-luminous electric radiators. The new automatic tailor iron exhibited is arranged so that it heats only when it is placed on the stand, and therefore does away with the objectionable trailing cord. The company had four demonstrators at its exhibit. One operated the toaster stove and steel hot plate, toasting bread and cooking cereals, etc. One demonstrated the family sewing-machine motor, one of which drove a sewing machine on which a regular seamstress made little garments, which after the show were to be donated to one of the orphan asylums in New York. Another demonstrator ironed the garments which had been made by the seamstress. The tailor's iron was demonstrated by a man who brought clothes from his tailor shop and did the actual work of pressing them at the exhibit. The booth was illuminated by festoons of low-voltage, twenty-five-watt tungsten lamps with Holophane

reflectors. Two large arches were lighted by tungsten lamps of various sizes, from twenty-five watts to 250 watts, one arch showing the entire line for 110 volts, while the other arch showed the 220-volt lamps. Tungsten sign lamps, both of the V and regular types, were shown in large letters.

Stanley & Patterson, of New York, displayed their wireless battery system, which consists of means for connecting dry cells in circuit without wires. Floor boxes and stage pockets were also shown.

The C. H. Wheeler Manufacturing Company, of Philadelphia, displayed a "Rotrex" vacuum pump and centrifugal circulating pump, and a suction, valveless, double-acting, high-vacuum pump.

The H. Krantz Manufacturing Company, of Brooklyn, displayed its extensive line of panel boards, switches, connection strips, outlet boxes and marine fixtures.

The DeVeau Telephone Manufacturing Company, of New York, exhibited various lines of telephone apparatus, including intercommunicating telephone systems, apartment-house telephones, branch exchanges, mine telephones and the Woodruff carriage-call system.

The American Electric Lamp Company, of Philadelphia, displayed views of its factory. On each side of the booth was a large case of lamps, one containing tungsten and tantalum lamps and the other carbon and metallized-filament lamps. A complete collection of miniature lamps was effectively shown.

The Otis Elevator Company, of New York, exhibited a working model of an Otis automatic push-button elevator. In order to show the working and parts of this type of elevator, a steel tower thirty feet high was used. At the top of the four posts of this tower were large electric globes, and underneath these enclosing the sheaths and governor were the words "Otis Elevator Company." The car was equipped with the usual call buttons and elevator electric lamp signals. The elevator used in this exhibit was the regular Otis, type "O," direct-current machine, with full automatic controllers mounted on the bedplate, and equipped with safety devices. Other features of the exhibit were models and illuminated photographs of prominent buildings equipped with Otis elevators, the most notable being an official model of the Metropolitan Life Insurance Company Building, the model being 1/100 of the actual size of the real structure, and equipped with Otis elevators.

The Watson-Stillman Company, New York, had on exhibition twin volute turbine pumps direct-connected to motors and pumping water for house-tank purposes against a pressure of from twenty-five to fifty pounds. A shaft straightener for straightening four-inch steel rods, a hydraulic punch, a hydraulic jack, hydraulic motor lift and a sixty-pound hydraulic broaching press operated by a motor were featured.

The Tucker Electrical Construction Company, New York, featured in its booth a seven-foot model of the Manhattan Bridge across the East river as it appeared during the Hudson-Fulton celebration. The Tucker company contracted for all the public work in the five boroughs and the bridge is illuminated by 350 eleven-volt, two-candlepower lamps.

The Shelton Electric Company, Chicago, exhibited a small hand hair-drier which furnishes either hot or cold air by merely touching a button and which weighs two-and-three-fourths pounds. Three kinds of vibratory massage machines designed for physicians, barbers and hairdressers and for home use were featured. A new pedestal hair-drier which gives large volumes of hot or cold air, and takes all the weight from the hand, attracted no little attention.

The Automatic Electric Washer Company, of Newton, Ia., had on exhibition two of its latest type motor-driven clothes washers and wringers. The noticeable feature about these machines is the mechanically reversible wringer, whereby clothing can be readily released from the rolls; also the raw-hide pinion and cut-gear drive, providing a simple, positive transmission. The entire machine is mounted on ball-bearing casters, and is claimed to occupy less space for equal capacity than any other washer on the market.

The Pelouze Electric Heater Company, of Chicago, made a very attractive exhibit of its various irons. One of the new features of the Pelouze line was the new twenty-pound tailor's-goose with three heats, adjustable while in operation. The low heat while heating the entire bottom surface of the iron is arranged to keep the iron at proper working temperature while left standing. The temperature can be controlled by a simple movement of the switch changing from one heat to another, the three heats being 200 volts, 400 volts and 800 volts. This iron has the well-known features of the four, six-and-one-half and nine-pound irons.

A prominent display was that made by the Sunray Electric Lamp Manufacturing Company. The Sunray arc lamp, using pure carbons, is an ingeniously designed and very simple piece of mechanism. Its claims for long life, short arc travel, minimum globe deposit and high efficiency were seemingly borne out. At the back of the booth were six Sunray lamps showing various progressive stages of the arc life. Above was a 120-hour Sunray lamp which was burned twelve hours per day during the entire show without retrimming. In the center of the booth was a table showing the parts of the lamp and one lamp assembled complete except for the casing. Above this were four lamps fitted with decorative dome shades. At the right of the booth was a set of instruments that could be connected to the circuit of any of the many lamps shown to determine its current consumption and regulation. Over the panel board controlling the various lamp circuits was shown a Sunray high-voltage arc for 240-volt circuits; this lamp is said to take about 150 volts at the arc and to be unusually efficient for this class of service. Attractive pamphlets describing the Sunray arcs were distributed.

The Metropolitan Engineering Company, of Brooklyn, had on display, in the booth of the New York Edison Company, its patented panel board, showing meter connection, and also various styles of its electric signs.

The Heany Lamp Company, of New York, occupied a double booth. A display of fireproof asbestos wire, tipless lamps of both carbon and tungsten filaments and the Heany arc lamp were included in the exhibit.

Sibley & Pitman, 26 Warren Street, New York city, showed a line of beautiful art-glass shades, portables and fixtures.

The Hurley Machine Company, of Chicago, made a fine exhibition of its well-known Thor and Chicago electric washing machines. These attracted much attention. In connection with the Thor machine was shown a universal rod capable of connecting to an ice-cream freezer, meat chopper, mangle and other household machines. An electrically driven ice machine having a capacity of freezing twenty pounds of ice in twenty minutes was also on display.

The Radio Reflector Company, of New York, showed a number of cabinets illustrating the advantages of its reflectors. One of these contained carbon incandescent lamps without shades or reflectors of any kind. Adjoining it was a similar cabinet having the same type of lamp, but equipped with Radio reflectors. A flashing sign containing 100 lamps was operated alternately with certain of the lamps equipped with reflectors, and others without, so as to show the advantages of the reflector.

The Vacuum Engineering Company, of New York, showed two vacuum cleaning equipments, one being a direct-connected single-sweeper apparatus, and the other a double-sweeper, chain-driven. These are designed for installation in the basements of large buildings with a system of pipes running to convenient points for connection to rubber-hose extensions.

The Chas. L. Kiewert Company, of New York and Milwaukee, showed in a very systematical arrangement the efficient lighting of a show window with Trucolor arc lamps. This lamp is of a slanting-carbon type, but uses pure carbons having no luminous chemicals and produces a clear white light, which is diffused by a prismatic hemisphere. Two Alba flaming arc lamps using vertical carbons, two Aurola, inclined-carbon, flame lamps and one Triplex lamp were effectively displayed on a fifteen-foot arch. Eight of the Alba lamps were used to illuminate the main tower of the Garden and were favorably commented upon for their powerful white light and broad distribution.

The New York Electrical School made an exhibit in the form of photographs showing the work that is carried out in its courses. Samples of drawings made by its students were also exhibited.

The Collins Wireless Telephone Company, of Newark, N. J., showed a variable tuning transformer, an auto-transformer and a rotating oscillation arc. This equipment was used, it is said, in the wireless-telephone experiments conducted between New York and Philadelphia.

The Economical Electric Lamp Company, of New York, showed an extensive line of Hyle and Economical turn-down lamps of the pull-string, turn-bulb and long-distance styles. Automatic flashers were used to turn the lamps up and down.

Fox Brothers & Company, of New York, showed their well-known Polar flame arc lamp and a set of miniature enclosed arc lamps and accessories. The latter were very complete. A new type of lamp, known as the Delta, was shown. The latter is capable of giving either white, yellow or golden color by proper selection of the electrodes, which are of special construction. A new form of Radiante miniature enclosed arc lamp was shown. It has a life of 100 hours at one trim, and is suitable for use on either 100 ten-volt circuits or two in series of 220 volts.

The Duntley Manufacturing Company, of Chicago, showed a variety of pneumatic cleaners, a novel scrubbing machine for renovating carpets, and a small gasoline-engine-driven generator having a capacity for lighting eight lamps and providing current for operating the sweeping machine.

The Murphy Electricity Rectifier Company, of Rochester, N. Y., showed one of its rotary disk type rectifiers, and also one of the stationary electrode type. The latter is self-starting and has no moving parts except a small synchronous motor. The Murphy rectifier is particularly adapted for charging of electric storage batteries and similar devices requiring direct current from an alternating-current source.

The Electrical Testing Laboratories, of New York, made a very interesting exhibit in which were particularly featured three of the numerous classes of tests made by them. Color booths illuminated by different light sources were shown to give their characteristic color values. A striking exhibit of the advance in the efficiency of lamps was made by comparison screens illuminated by the various types of incandescents. An extensive exhibit of testing machines and instruments for conducting tensile, torsion and elasticity tests, as well as conductivity and insulation tests, were shown.

The National Electrical Lamp Association booth occupied a very prominent position and this, coupled with the general attractiveness of design and decoration employed, prompted favorable comment from visitors. In the center of the booth all the regular types of tungsten, tantalum and Gem lamps were displayed in glass cases. On racks placed in the rear of the booth were exhibited lamps of the regular tungsten 110 and 220-volt type, tungsten street series and five-watt sign lamps, 220-volt tantalum and the new tantalum street-car lamp. A particularly interesting feature of the exhibit was a collection of historic incandescent lamps.

F. L. Smidth & Company, engineers and manufacturers of cement-grinding machinery, showed a novel belt drive called a "Lenix Drive." A ten-horsepower motor with a six-inch diameter pulley was belted to an eighty-four-inch diameter superposed pulley, with belt centers of not more than sixty-six inches. The arc of contact between the belt and the large pulley was approximately 266 degrees and for the small pulley 200 degrees. This is accomplished by means of the Lenix roller, having its bearings in a curved arm turning on the axis of a cast-iron stand.

Roger Williams, New York agent of the Simplex Electric Heating Company, showed over 200 different Simplex heating devices. The latest article is a toaster which is all nickel-plated and designed to close up while toasting so as to save the heat and toast faster. There were also complete lines of flatirons, water cups, heating pads of the very flexible type, curling-irons, chafing-dishes, percolators, teakettles, saucepans, blazers, double boilers, sterilizers, soldering irons, gluepots, and numerous other articles. In the exhibit was a photograph of the ironing room of the Star Shirt Factory, Bridgeport, Conn., where 200 electric irons are in use. A complete Simplex range was in operation in the Brooklyn Edison exhibit, with a heater for heating water for washing dishes. In the sewing-room exhibit of the New York Edison Company, Simplex irons were used; a small section of the electric ovens used for baking "Shredded Wheat" biscuits was also shown; of these 20,000 have been supplied by the Simplex company. In various other exhibits Simplex electric-heating devices were shown, making candy, and other dainty edibles.

Chicago Electric Club.

On October 13, following the regular Wednesday midday luncheon, E. P. Warner, of the Western Electric Company, addressed the Chicago Electric Club on the subject, "Electricity and Magnetism from a Yachtsman's Standpoint." Mr. Warner's thirty years' yachting experience makes him peculiarly fitted to discuss this subject.

Aboard a yacht electricity is used principally for lighting purposes, and Mr. Warner began his address by relating particulars of an electric-light installation that was made aboard a yacht some fourteen years ago. Generating units and storage batteries were installed, the latter being at that time comparatively new. Much trouble was experienced in keeping the batteries in order, it being necessary to have an expert make several long trips to the yacht in order to keep them in repair. At the end of the yachting season the batteries had given in all only about four nights' continuous service and the expense was enormous. Mr. Warner then reviewed the rapid advancement of the manner in which electricity has contributed toward the comfort and safety of pleasure sailing.

Regarding magnetism the various difficulties encountered with the mariner's compass were given. The troubles of variation and deviation of the compass needle were explained, and Mr. Warner pointed out that serious trouble often resulted from the variation of the compass when in certain localities. Deviation is generally caused by local conditions aboard the ship, and a number of experiences were cited showing that a great deal of care must be taken by yachtsmen in keeping magnetic substances away from the vicinity of the compass.

Among the experiences related in connection with this subject was one wherein an experienced yachtsman sailed completely out of his course by reason of a companion's standing near the compass with a magnet about his person.

A number of incidents regarding electric phenomena in connection with storms were related. Mr. Warner told of his experience on a northern cruise, during a severe storm, when immediately following a heavy discharge of lightning the uppermost points of the masts, flagpoles, etc., were suddenly lighted by a small bluish flame. This phenomenon is well known among sailors, and is generally taken as a sign that the storm will soon cease.

Mr. Warner related a number of typical fog stories, and concluded his address by summing up the various systems of lighting yachts, and expressed an opinion that eventually electricity will be the foremost illuminant in this field.

Illinois State Electric Association.

The next annual convention of the Illinois State Electric Association will be held, as already announced, on October 26 to 28, at Alton, Ill. In preparing for the convention, Secretary H. E. Chubbuck is making a special effort to increase the membership of the association. He has published a list of 122 cities and villages of Illinois in which there are central stations that are now members. If these members will exercise a little effort they can make the Illinois association the largest of any of the state electrical associations.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

TELEGRAPH AND TELEPHONE SYSTEMS AS AFFECTED BY ALTERNATING-CURRENT LINES.

The two-hundred-and-thirty-ninth meeting of the American Institute of Electrical Engineers was held on Friday evening, October 8 last, at the Engineering Societies Building, New York city, President L. B. Stillwell in the chair. After the meeting was called to order by the president, Acting Secretary F. L. Hutchinson presented his report of associate members elected (ninety-four) and associate members transferred to the grade of members (six).

The president then proceeded to introduce the speaker for the evening, J. B. Taylor, of the Railway Engineering Department of the General Electric Company, Schenectady, N. Y., who was to read a paper entitled "Telegraph and Telephone Systems as Affected by Alternating-Current Lines." The president commented tersely on the question of "right-of-way," which has arisen in the shape of degree of damage caused by electrolysis of existing sub-surface structures due to the utilization of the earth as a return circuit by electric railways and other electrical interests. Although the points raised in this connection had not as yet been fully adjudicated, Mr. Stillwell opined that future decisions in the courts would be along the same lines as those in general already given, substantially that no individual interest can own the earth, that adjustment must be sought along reasonable lines, and that the principle of give and take must be recognized. Scientists must first ascertain the facts and then proceed to find a cure or a preventive rather than permit the conflicting interests to take the dispute into the courts. If this is impossible, then the principles of justice and fair play may be relied upon to effect a final adjustment. The opposite policy, as instanced by the stand the American Water Works Association had taken in the matter, was much to be deplored, amounting, as it did in effect, to a declaration that no electric railway should be permitted to use a grounded return, that they should keep off the earth, and should double-trolley everything. J. B. Taylor was then introduced to read "the first paper before the Institute on this interesting apparent conflict between the etheric vibrations utilized by the telegraph and telephone systems and those caused by the alternating-current lines."

The president's remarks were greeted with an outburst of applause, whereupon Mr. Taylor proceeded to read his paper, an abstract of which follows:

The purpose of this paper is to give a general statement of power transmission and telegraph and telephone conditions as they exist, with special reference to combinations which may make trouble if simultaneous operation is attempted in too close proximity. It should be borne in mind that induction between circuits is a mutual affair, the principal distinction being that a high-voltage transmission line conveying perhaps 1,000 to 5,000 kilowatts is not disturbed by, nor even able to detect, a few extra volts derived by induction from a telegraph line on the other side of the highway. The converse of this proposition is by no means true, and this points to the desirability of power-transmission systems doing everything possible to keep the stresses and strains in the ether within the boundaries of their own right-of-way, and the equal importance of telegraph and telephone apparatus and lines being so constructed and maintained that they will be as far as possible independent of stresses and strains which may be unavoidably introduced into the portion of the ether which they occupy. An adequate consideration and solution of the problem necessarily involves an intimate study of the characteristics and sensibilities of telephone and telegraph instruments as well as a calculation of disturbing electromotive-forces and currents induced in their circuits with values depending upon all the various features of construction and operation of the power lines. The author proceeded to discuss, with the aid of circuit diagrams, the various types of telegraph systems. Results of some tests were given in detail and oscillograms were given showing the current in the main line relay and in the local sounder with twenty-five-cycle alternating current superimposed on the line. Special apparatus was then described by the aid of diagrams, showing how improvement may be effected in cases where the telegraph disturbance is slight. The methods of doing this are as follows: Increasing impedance of line; increasing working current; shunting apparatus with condensers or non-inductive resistance; placing short-circuited secondary winding on relay; placing neutralizing winding on relay; using back contact of relay with reversing sounder. The devices considered just above are only palliative remedies. When the amount of power transmitted, length of line, or small separation of the two circuits is such as to make the disturbance severe, definite neutralizing conditions must be introduced. If we can introduce into a telegraph circuit voltages equal and opposite to those derived by electromagnetic induction, and at the same time supply to the line the charge demanded by electrostatic induction, we shall succeed in neutralizing the inductive effects. Some of the methods of doing this were discussed, with the help of a diagram. In spite of all of the arrangements of alternating-current circuits which may be employed to eliminate or reduce disturbing inductive effects, in some situations it may be cheaper or more desirable to make use of a metallic circuit for the telegraph. Any form of metallic-circuit telegraph will be less sensitive than a circuit with earth return, but the full benefit of the metallic circuit is to be derived only when following the "balancing" principles used in telephone service. Several telegraph circuits with wire returns were diagrammatically illustrated, and each considered in detail. Proceeding with the subject of telephones, the author began by stating that nowadays practically all telephone circuits employed a return wire instead of using a single conductor with an earth return. The whole science of having a perfectly quiet telephone line is dependent on the Wheatstone bridge principle, that no current will flow in the wire or instrument connecting two points at the same potential, even though these two points are on conductors carrying currents of considerable magnitude. The practical application of this principle requires that each wire of a telephone circuit shall have the same resistance, the same inductance, the same capacity, and the same insulation resistance; and more exactly, that these conditions of equality shall hold, not only for the circuit as a whole, but for each and every short section of the circuit. Still more exactly, these conditions of equality must hold for the entire range of frequency to which the apparatus is sensitive and for currents of any magnitude that are likely to be introduced into the circuit. In practice these ideal conditions can be attained only approximately, even after making numerous transpositions of the two conductors. The author described various telephone systems in detail with regard to these points and with the aid of diagrams and figures from practice. He went into the question of the frequency of speech currents for commercial telephone quality and referred to some results given by Lord Rayleigh (Theory of Sound, Vol. 1, page 473) and Mr. Fowle (Transactions A. I. E. E., Vol. 22, page 659), diagrammatically shown by curves of sensibility to different frequencies. Some curves were given in the paper relating to this subject, as were also some oscillograph records of the vowel sound *i* (as in machine) taken from two different makes of receiver. Physiological phenomena bearing on this question of telephone sensibility were briefly discussed. Forms of telephones for high-tension transmission-line service were next considered and a form of telephone insulating transformer (tested to 25,000 volts) was illustrated and described. The author emphasized the fact that eternal vigilance on any telephone system is the price of first-class service. Alternating-current systems formed the next section of the paper. A historical introduction was first given, and descriptions of various systems in present use, with diagrams, were given in some detail. Harmonics and irregularities were next analyzed and oscillograms of currents and electromotive-forces of transformers, single-phase trolley systems and telephone systems were shown. The single-phase railway was then taken up and typical diagrams were given showing the transformation and distribution arrangements. In discussing this question the author said that, while it would be possible, it is by no means easily practicable to have a double-trolley, single-phase railway system; and, considered inductively, such a system would be on a par with any of the other metallic-circuit, alternating-current systems. Various distribution arrangements requiring additional conductors were then examined in detail with the aid of diagrams. In one of the schemes shown, by having the neutralizing wire as close as possible to the trolley wire, no calculations or experiments are necessary, and the same wire will neutralize equally well for various telephone lines, even if on opposite sides of the track and at various distances. The paper concluded with sections on the calculation of inductive disturbances and a comparison of electromagnetic and electrostatic effects. The author's conclusions,

given as a summary, are as follows: (1) All working conductors are surrounded by electromagnetic and electrostatic fields. These fields induce electromotive-forces and charges in neighboring conductors. With an ideal metallic circuit, external fields are a minimum. Similarly, an ideal metallic circuit may be in fields of any strength without being disturbed. (2) Practical considerations prevent these ideal conditions from being realized. Hence currents will be induced in any conductors wherever placed as a result of currents and potentials on other conductors. Disturbance results only when these induced currents are of sufficient magnitude to be objectionable. (3) Commercial telephone lines have little margin to meet disturbing conditions more severe than normal. An increase of telephone currents to three or four times their present values would doubtless result in great disturbance to other wires in the same telephone system and require new standards of construction and maintenance. The same statement applies to telegraph systems. (4) Theoretically a balanced telephone line can be operated in proximity to alternating-current wires. This is not true of a telegraph line, as there is no way of balancing a circuit using earth return. (5) Where trouble is experienced on a telephone line it may be possible to clear same by putting the system in first-class condition. Where trouble is experienced on a telegraph line, some change in the apparatus or circuit arrangements will be necessary. (6) For any given case, all the features of the power system and signaling system should be taken into account with a view to arriving at the proper procedure to reduce or to eliminate the disturbances.

The president characterized the paper as an exceptionally interesting and important one, and proceeded to call upon Charles F. Scott to open the discussion.

Mr. Scott, in telling of a single-phase railway system in his experience, said that the electromagnetic induction was considered to be the most serious element and that he set about to devise some method of counteracting it. As the load on a railway is shifting, there must be many sections, and even then the induction in the telegraph wire will change gradually as the train moves, while the induction in the transformer changes instantly when the train passes it. Moreover, the induction in the telegraph line is not proportional to the current in the trolley wire, but depends also upon the proportion of current which flows in the rails and that which flows in the earth. This variable proportion is dependent upon the number of tracks, the distance from the train, and other conditions. After some consideration he proposed to wind the primary of the transformer differentially by including certain turns in series with the trolley and other turns in series with the rail, so as to make the electromotive-force induced in the transformer more nearly equal to that induced in the line. While this did not offer a complete remedy, it appeared to be a step in the right direction and worthy of a trial. He turned the matter over to A. J. Sweet, asking that he work out the design of a transformer for trial test. In a few days he reported that he had studied out a modification which would overcome the fundamental objections of the transformer with double primary coils. He then described the method, which was later adopted on the telegraph circuits paralleling the electrified portion of the New York, New Haven & Hartford Railroad, which is briefly told. A neutralizing circuit having practically the same exposure as the telegraph wire is employed as the primary circuit for supplying the neutralizing transformer. This in turn gives a secondary electromotive-force, which is practically equal to that induced in the telegraph wire. The two are connected in opposition. In order to appreciate more fully the intricate problem which is presented it is interesting to note the principal variables which have an effect upon the electromotive-force produced in an adjacent wire: (1) The current in the trolley wire, the amount of which varies with the load; (2) the current in the rails; (3) the current in the earth and the effective position of this current; (4) the phase of the current which is not the same in the trolley, the track, and the earth; (5) the length of exposure, which depends upon the varying position of moving trains; (6) the distance from the railway or primary circuit to the telegraph wire, which in a road with two or more tracks is liable to change without notice. By taking a suitable number of turns the electromotive-force on the secondary is made practically identical with the electromotive-force in the telegraph wires. The tendency for alternating current to flow in the telegraph circuit is therefore eliminated. As the secondary coil carries no alternating current, the transformer acts as if on open circuit. The transformer may therefore carry a number of secondary coils, each connected to its own telegraph circuit. It is found that the secondary coils introduce but little impedance into the telegraph circuits and that the increased mutual induction between telegraph circuits is inappreciable. The arrangement and capacity of the neutralizing transformer is adapted to the particular conditions in which it is to be placed. The neutralizing circuit is grounded just beyond the ends of the exposed section. If this is long, two or more neutralizing transformers may be installed, and the neutralizing circuit may preferably be grounded midway between adjacent transformers. Some time before the electric service was inaugurated on the New Haven road, the engineers of the telegraph company made inquiry in regard to the conditions which might be anticipated. These were discussed, and the above-described system of neutralizing transformers was explained. An order was placed for a number of transformers about a year before the electric service was started. The transformers were built and installed and are now operating as originally designed. The transformer is of the simplest type and is adequate for handling a large number of telegraph circuits. The transformers along the New Haven road are arranged for the accommodation of thirty telegraph wires. It was found that the electrostatic effect upon the telegraph wires, although paralleling a 10,000-volt trolley for a long way at a distance of only a few feet, appears to be nil on the New Haven system. This is presumably due to a considerable number of telephone wires, which probably distributed the charge among themselves, and, as these wires are grounded in regular service, the effects due to electrostatic induction have introduced no serious effects, and, indeed, have failed to be discovered. Mr. Scott concluded his remarks with a critical review of some of the points raised by Mr. Taylor in his paper.

A. W. Copley described some tests made on the single-phase installation on the New York, New Haven & Hartford Railroad, for the determination of the nature of disturbances in neighboring telegraph lines caused by current in the power circuit and the causes of and the remedies for such disturbances. Bad weather conditions were approximateed by placing leakages between lines and ground. Several different adjustments were made on the telegraph instruments by a telegraph expert, when there was no alternating current in the line, these adjustments being made to correspond with what might be met with in practice. After each adjustment, alternating current was introduced into the circuit in increasing amounts, until it began to affect the working of the instruments. The ratio of the alternating-current voltage to the working direct-current voltage was then taken. This was tried for alternating current of both twenty-five and fifteen cycles, and on simplex, duplex and quadruplex circuits. The first tests made on simplex circuits were made with box

relays in the circuit. These are relays which act as sounders, and with them no local circuit is necessary. It was found that these relays showed the effects of the alternating voltage at very low values, the signals becoming uneven, and mushy. The box relays are seldom used in actual circuits, and therefore no figures were taken under this condition. The usual simplex circuit uses neutral relays which close local sounder circuits. Tests made with these relays gave the ratio of allowable alternating voltage to direct current working voltage as about 0.5 for twenty-five cycles, and 0.4 for fifteen cycles. Duplex circuits are less sensitive, the ratio in this case averaging 0.9 for twenty-five cycles, and 0.7 for fifteen cycles. Quadruplex circuits are by far the most sensitive, and show a great deal of variation, but average values of 0.2 and 0.15 were obtained for the ratios at twenty-five and fifteen cycles, respectively. Results on actual lines checked closely with the above results. Mr. Copley pointed out the fact that although the allowable fifteen-cycle voltage is only about seventy-five per cent of the allowable twenty-five-cycle electromotive-force, the voltage induced by a given amount of current at fifteen cycles, is only 0.6 of that induced at twenty-five cycles, and therefore the telegraph lines are slightly better off with the lower frequency. It is seen then that disturbance can be overcome if only the working direct-current voltage is made high enough. This is quite an effective method as long as the direct current is not increased above allowable limits. The method is substantially the same as the second remedy given by Mr. Taylor, *i. e.*, increasing the working current. If it is undesirable to increase the current, but increase of voltage is allowable, a combination of his first and second methods may be used, increasing the impedance of resistance of the line, and at the same time the direct-current voltage, holding the current constant. The last remedy he mentions, the bug-trap arrangement, devised by Edison in the early days of the quadruplex, might be emphasized. Tests made with this device showed that it was possible to work a simplex line in which the alternating induced electromotive-force had several times the value of the direct-current voltage, but it was found to be inapplicable to cases where the alternating voltage varied. If the induced electromotive-force is steady, the arrangement is quite efficient, but if not, the relays must be constantly adjusted.

In regard to the calculation of inductive disturbances, Mr. Taylor has indicated the importance of a knowledge of the values and the positions of the currents in the various parts of the circuit. In particular, it is necessary to know the amount and effective position of the earth current. From theoretical statements, it appears that part of the return current would be found in the rails and a part at the image of the trolley wire. But tests made on the New Haven road and at other places indicate that the effective position of the earth current is far below this image; in fact, its depth is in the order of ten times the depth of the image.

W. S. Murray said in part: I think the best way to discuss this subject—at least, from the railroad point of view—is to get down as closely as possible to the actual facts of the situation. While the first installation of the single-phase system, as arranged on the New Haven road produces a maximum induction, it is not uninteresting, however, to note that as extensions of it go into effect, by reason of power stations delivering current virtually dividing itself in equal amounts and in opposite directions along the right-of-way, the inductive effects will tend to eliminate themselves, and the future will be more free from them than the preesnt. Mr. Murray proceeded to tell in detail of a conference held recently by officials and engineers of the New Haven road with regard to the induction problem. In conclusion, referring to this road, he said: "Our records for the month of July, 1909, show that the electric-locomotive mileage was 14,000 miles per engine failure, while for steam the figure was 6,238 miles per engine failure. Thus the steam record was less than forty-five per cent as good as the electric."

Mr. Hutchinson at this point handed in a written discussion sent in by L. C. Nicholson, of Buffalo. Mr. Nicholson wrote in part as follows: The five-phase, 60,000-volt, twenty-five-cycle transmission lines of the Niagara, Lockport & Ontario Power Company from Niagara Falls to Syracuse run parallel and closely adjacent to the same company's private telephone lines for a distance of 200 miles and to Western Union telegraph and telephone circuits for 125 miles. The separation between the power lines and the private telephone line varies from 150 feet to ten feet, the average distance being about fifty-six feet, and between the power lines and Western Union lines the average distance is about seventy feet, though frequently not more than thirty feet. The power lines are transposed only where they are parallel to Western Union circuits. The private telephone line is a copper circuit, on separate poles on the power-line right-of-way. The wires are transposed ten times per mile. The Western Union circuits consist of one continuous two-wire telephone circuit transposed twice per mile, and eighteen telegraph ground-return circuits using from seventy to 250 volts storage-battery current. Originally and before voltage was put on the power line paralleling the Western Union circuit, transpositions were carefully put in to prevent induction effects. In a distance of 105 miles thirty 120-degree transpositions, or ten total transpositions, were placed at intervals varying from three to five miles. After more than a year's operation of this line transmitting some 6,000 horsepower, during which time no disturbance of any kind arising from normal operation was felt on the adjacent telephone or telegraph lines, eighteen of the thirty transpositions were changed so that the upper conductor was no longer transposed, but remained the upper conductor for a distance of fifty-seven miles. The two lower conductors were transposed 180 degrees at the original transposition points. The remaining twelve 120-degree transpositions covering forty-eight miles were unchanged. Evidently the 180-degree transposition scheme gives a circuit equivalent to a non-transposed single-phase circuit, the two conductors of which are in a vertical plane with, in this case, six feet separation. During two years' operation of this line with loads as high as 15,000 horsepower no disturbance is felt on adjacent parallel telephone and telegraph circuits, during normal operation. In view of this experience, transpositions of the power wires are considered entirely unnecessary, and in subsequent lines which have been built contiguous to foreign circuits no transpositions have been made. As stated above, neither the private telephone system nor the Western Union telephone or telegraph circuits can detect the presence of the power circuits when operating normally. However, when a ground occurs on one phase of the power line the electrostatic unbalancing causes chattering of telegraph instruments and sometimes blows fuses in the telegraph or telephone circuits. These disturbances are always of short duration, being usually less than twenty seconds,

which is the maximum time a ground can remain on any part of the system before being automatically cut off. Electromagnetic effects of a ground are felt only slightly, on account of a high resistance placed in the neutral connection to earth of the sending transformers, which allows the passage of approximately thirty amperes earth current. Formerly when the system was operated with a thoroughly grounded neutral, the electromagnetic effects were considerable on account of short-circuit currents to earth, sometimes burning out fuses, relays and lightning arresters. Other forms of abnormal operation have been experienced, and their effects upon parallel circuits noted. Single-phase power transmitted over two wires of a three-phase line causes no disturbance. The combination of transmitting three-phase power approximately one-half the total distance and single-phase power the remaining distance, has never caused any inductive disturbance of any kind. Transmitting power three-phase over duplicate lines separated from each other several miles, using two conductors of one line and one conductor of the other line to make up a single three-phase circuit, causes disturbances which appear to be due entirely to electromagnetic induction. Thus, normal voltage on only one wire of either line causes no trouble unless considerable three-phase load is delivered (using two wires of the other line), showing that the purely electrostatic effect is negligible under conditions of normal voltage. When, however, a ground occurs on one phase, causing full line potential to exist between the other two phases to ground, the electrostatic effect shows up in a mild form, as mentioned above. In general, experience shows that with separation between power and telephone lines, as mentioned above, transposition of power wires is unnecessary; that transient electrostatic and electromagnetic effects accompanying grounds on the power line are mild and of slight consequence; that the only class of disturbances that will cause trouble to telephone or telegraph instruments is caused by heavy electromagnetic effects induced by short-current currents passing through the earth for considerable distances, as may occur in star-connected, high-power, high-voltage systems which operate with a grounded neutral.

Dr. C. P. Steinmetz, after generally commending the paper, said in part: I cannot agree with Mr. Taylor's explanation of the greater frequency of ground and arc circuits as being due to higher voltage. After giving his reasons, Doctor Steinmetz said that it has become the almost general custom where arcs are operated from alternating-current systems to separate the arc circuit by the transformer from the primary distribution system; that is, to use constant current transformers. Furthermore, he did not quite agree with Mr. Taylor in the harmlessness or improbability of trouble from the third harmonic generator wave in the telegraph and telephone circuit. The engineers of the General Electric Company had some years ago tried the idea in regard to the high-voltage transmission, of grounding the generator neutrals. The telephone line was put out of service absolutely, and they were obliged to take off the ground and then the line operated again. At that time they took an oscillograph of the neutral generators and found the third harmonic very greatly surmounted by the minor circuit. Since the circuit was forty and the third harmonic 500 it conformed fairly close to the maximum of the car for frequency. This illustrates what Mr. Taylor has said that one may expect more trouble from the higher harmonics of the generator, since these higher harmonics have a greater physiological equivalent in the car than the fundamental. The speaker then went into the question of the image conductor, which he said was frequently misunderstood. He said that there is need of a Faraday to give us such a clear conception of the electrostatic field, as we have it of the electromagnetic field, that it can deal with the lines of electrostatic force.

In conclusion, Doctor Steinmetz remarked that in calculating capacities from inductance by the velocity of light, the error is that the actual velocity is slower than that of light due to the energy loss in the electric circuit which retards the velocity, but if in the induction we do not use the total inductance of the conductor —that is, the external inductance and not the numerical part—then we eliminate the relation due to the loss and get the correct relation.

The President then called on Mr. Taylor to close the discussion. Mr. Taylor replied briefly to the various points raised without departing radically from the position he had assumed in his paper. He proposed to look over the list of Mr. Murray's questions later, and possibly to contribute something more to the record of the discussion on this account.

Mr. Scott spoke of Secretary Pope's trip through the West, and the president, before adjourning the meeting, thanked all the speakers for their efforts. In conclusion, he said: "I would also say that at any time when members of the Institute are contemplating visits to the West or to the South—the more remote sections of the country—that they will let the officers of the Institute know it in order that we may utilize the peripatetic services of our members in this manner, as we believe it will certainly work out to the ultimate good of all concerned."

Kings County Electric Bond Issue.

Announcement is made that the directors of the Kings County Electric Light and Power Company, of Brooklyn, have voted to recommend to the stockholders the authorization of an issue of $5,000,000 convertible debenture bonds, bearing interest at six per cent, convertible into stock of the company, at the option of the holders, after three years, the bonds to be payable in twelve years. Application will be made at once to the Public Service Commission for approval.

It is believed that the first issue of bonds will be offered to the stockholders of the company on or about January 1.

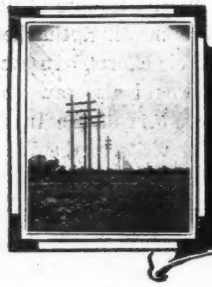
To Lengthen Subway Platforms.

The New York city Board of Estimate voted recently the $1,500,000 asked by the New York Public Service Commission last spring for the lengthening of the Interborough subway stations. The requisitions call for $1,150,000 for the lengthening of the subway platforms from the Brooklyn Bridge northward, and $350,000 for similar improvement between the Brooklyn Bridge station and the Atlantic Avenue terminal in Brooklyn. The express stations are to be changed so as to accommodate ten cars instead of eight, and the local stations so as to accommodate eight cars instead of six. The work will be begun in the near future, but will take some time, as it will have to be done without interrupting the service.

Wireless Talk with Honolulu.

The army transport Buford, which arrived recently from Manila at Honolulu, reports that wireless communication was established with the Pacific Coast four days before the vessel made this port. This means that messages were interchanged over a distance of 3,300 miles.

The Buford is supposed to have the most powerful wireless equipment afloat in the Pacific Ocean.



CENTRAL-STATION PRACTICE

Transmission—Interior Wiring

Steam Heating in Connection with Central Stations.[1]

District steam heating is coming into more and more prominence, but is still neglected in many localities where it would be found most profitable. In such cases the electric-light company could install a low-pressure steam-heating plant along the lines that have been so well tried out during the last twenty years. In the case of an old plant which had reached its limit of efficiency, and yet is unsatisfactory in comparison with modern equipment, the investment necessary for a district steam system would be lower than that necessary for modern equipment, and the results obtained would favorably compare with, and probably exceed, those of a thoroughly modern plant without a district steam system. In connection with the modern plant, a steam-heating system has been found in many cases to pay for the entire coal bill of the plant, and leave a substantial balance besides.

What is generally conceded today to be the best practice, is a system, the extent of which is such, that the exhaust steam from the plant will meet the average demand in ordinary weather. Then in extreme weather, live steam, in necessary quantities, may be added to help out.

In starting a steam-heating system in connection with an electric-light plant, a steam-heating company should be organized and merged with the electric company, so that the right to sell live steam cannot be questioned, if live steam is necessary when the system grows to the extent that it is required to supply the demand. Thus merged, the company is well equipped to meet competition, and to obtain business from office buildings, theatres, apartment houses, hotels, municipal and school buildings, which otherwise could not be prevented from operating or installing isolated plants of their own.

The care of the street installation is quite easy and inexpensive, if designed and installed by careful and experienced engineers. No cheap installation can be expected to give good results, and if the best material and construction known is not used it is for the best not to install any until it can be afforded. The work must all be done carefully and to grade, so that the whole system will drain its condensation to points where it may be readily trapped off. There must be no low spots without traps, where the condensation will accumulate. The bottom of the trench also requires special attention and should consist of broken stone or coarse gravel, in which one or two drain pipes should be laid, that the ground around the main shall have a good drainage and be as dry as possible. In some installations an effort has been made to get a return of the trapped condensation to the plant, but the cost of this is prohibitive in anything but a small, very compact system located in close proximity to the plant. At the plant the exhaust steam should be passed through a separator before entering the mains, for the purpose of removing the condensation and oil that passes with it from the engines.

The usual season for the demand for steam is from the middle of September to the first or middle of June. Depending on the conditions, however, some companies find it profitable or desirable to keep steam on during the summer months. This will cost but little in non-condensing plants, and a neat business may be built up, as well, by being able to furnish a continuous supply of steam for hot-water tanks in hotels, restaurants, flat buildings, barber shops, laundries, steam lunch-tables, dish-washing machines, coffee urns, etc.

In hilly districts the mains should be carefully trapped at frequent intervals to do away with a down-hill rush of condensation. Care must be taken in locating these main traps.

Services are usually installed from the mains into buildings at cost. The company usually furnishes at cost the reducing valves, cooling or economy coil, and trap, which are necessary, except in those buildings piped on the "atmospheric" system, in which case economy coils are not needed. It is always best, particularly in meter installations, to get consumers to install a separator.

Flat rates should be avoided, if possible, and if given at all should be on office buildings, where the maximum demand for heat is for only twelve hours. They are based on the total square feet of radiation connected or else on the cubical space heated. A flat-rate customer as a rule will practice no economy at all, and, when the house gets too hot, will invariably throw open doors and windows rather than take the trouble to turn off the steam. From thirty cents per square foot up, for direct radiation, and from forty cents per square foot up, for indirect radiation per year, is the usual flat-rate charge when based on radiation. This varies in different localities, due principally to the cost of coal.

On metered condensation the charge is made at so much per 1,000 pounds of steam condensed. The rates that I have record of in this state vary from forty cents to seventy-five cents either for all the condensation or for the first 10,000 pounds. A number of companies use a sliding-scale rate, which is a very good plan, as it is only right that in steam, as in other commodities, the large consumer should get lower rates than the small. The lowest rate I have received is a sliding scale from Johnstown, Pa. It starts with forty cents for the first 10,000 pounds of condensation per month.

The opinion of the various companies in this state, from which information was received, is certainly in favor of the almost total use of the condensation meter, as it produces many ideal conditions. After the first few bills have been received it speedily stops all waste, and the consumer very suddenly acquires the habit of turning off the steam instead of opening windows. They are more willing to cover bare pipes, and it in general educates them so that they take greater in-

[1] Abstract of a paper by Paul Mueller, of Erie, Pa., and others, presented at the second annual convention of the Pennsylvania Electric Association, Eagles Mere, Pa., September 8, 9 and 10.

terest and better care of their heating apparatus. The benefit of the meter is best illustrated by a plotted curve of steam consumption of a plant before and after meters are installed. There will be gradual peaks in the morning and evening and some falling off at night, on the flat-rate chart. In comparison with this the same curve, with meters used, will show a marked decrease in total steam consumption with much more prominent peaks. There will be a sharp rise in the morning, as people turn on steam when they get up, to warm the house after it has cooled off during the night, and this will gradually fall off by 10 o'clock, as the day gets warmer. It will gradually pick up again after 3 o'clock, when the sun goes down, and the cold of the evening begins. From this peak it will fall off pretty rapidly as the steam is shut off before people retire for the night.

The condensation meter itself here deserves a little attention. Its principle is very simple, being that of a balance. On each side of the balance is a receptacle or cup that holds just a given weight of water, according to the size of the meter. The condensation always flows into the cup that is up, and when it receives its full weight it overbalances and goes down and empties, the cup on the other side going up, and into it the condensation then flows. The balance is connected to a dial gearing, which registers the number of pounds discharged. Occasionally, however, one will be stopped by rust or scale from the steam pipes. As a rule, it is best to employ the meter readers during the summer, while the heat is off, to inspect each meter, thoroughly clean, test, and readjust it and put it back ready for the fall season.

As it is usually considered advisable for electric-lighting companies to leave interior work to local jobbers, and not shoulder the responsibility for its later satisfaction, so is it advisable for the steam-heat company, aside from having clearly defined rules and regulations regarding piping, to go no farther than installing service, connecting it up, and installing the meter. Before the steam is turned in to the consumer's apparatus it is essential that all of his system be carefully inspected. If on a flat rate, all piping should be covered, or else included in the total radiation on which charge is based. On meter, care should be taken to point out to the consumer all things which will tend to increase the steam consumption. If these matters are clearly pointed out to him in advance, many complaints are saved.

After a season or two of use the consumer will appreciate the many advantages of city steam with which actual experience was necessary to show him its value.

Some of these advantages frequently overlooked are as follows: (1) In a new house or building, no boiler is required, and if a hot-water system had been considered, a saving of about forty per cent in the amount of radiation necessary to install would be accomplished. (2) With no boiler, the danger of boiler explosion and trouble of boiler inspection disappears, and in some cases a lower rate of fire insurance has been obtained. (3) Increased cleanliness about the house, cellar and grounds, as there is no coal and ash dust to blow about. (4) No repairing of boiler, or boiler to give out in the middle of winter, and any troubles the customer does have are assumed by the steam-heating company, which employs competent men to take care of them. (5) Janitor service greatly reduced, if not entirely done away with. (6) Steam is always there, day and night, and always ready for use when required, and an even temperature can be maintained at all times.

The successful and most economical operation of a power house using its exhaust steam for heating is a thing that has to be carefully worked out for each individual case, the point aimed at, of course, being to generate both steam and electricity as cheaply as possible. The demand of one must be balanced against the demand of the other, and a happy medium arrived at, by operating only the equipment best suited to the conditions, with no aid or as little as possible from live steam. A good illustration of this follows:

An electric-light plant, also furnishing steam for heating purposes, was operating one winter day with thermometer ten degrees above zero. Two engines were running which, by reason of the electric load, developed 200 horsepower, and this necessitated the use of a certain amount of live steam to keep the pressure on the steam mains constant. A third engine was started and a portion of the electric load transferred to its generator. Seemingly strange, the pressure at once increased on the steam mains, and one boiler could be shut down. This plant also demonstrates that they use more coal when their electric load is lightest and live steam has to be resorted to, than they do when carrying the peak. The matter of back pressure on engines should here be taken up. From the experience gained at Erie, Pa., during the last ten years in the heating business, it has been found that the back pressure is the most profitable load the engines carry. Ten years ago a man that attempted to operate a high-speed engine maintaining a back pressure of any amount in excess of five pounds, would speedily have his reputation as an engineer at stake; but today engines are operated in one plant where the initial pressure is 150 pounds with thirty-five pounds back pressure. Furthermore, at the present time you can place an order for an engine which the builders will guarantee to operate successfully at a back pressure of twenty pounds and at the same time develop a full load. The value of the back-pressure load of the engines at Erie, Pa., is rated so high that, in the author's opinion, an electric-light plant furnishing steam heat can afford as a matter of economy to run simple engines, belted or direct-connected to generator, and dissipate or throw away, through the medium of a large rheostat, into a stream of water, the electric output of the generator and to use the exhaust steam for heating purposes. Furthermore, this is being done profitably at that station, and it is a common occurrence to start an engine with but a friction load in order to get exhaust steam to turn into the mains. This certainly is a very broad statement in regard to the merits of exhaust steam versus live steam, and I hope we can have a very interesting discussion later on this point, and that there will be light thrown on the theory involved. There is no doubt that the point has been reached where we have the right to wonder whether it is the steam or the electricity that is the by-product.

Performance of a Destructor Plant.

The following particulars have been published of the performance of the destructor plant supplied to the Prahran Municipality, Victoria, by Meldrum Bros., Ltd., of Temperly, near Manchester, Eng.: Total weight of refuse burned for the month of July, 661 long tons and 231 pounds; electricity generated in British thermal units, from 33.36 to 48.30 per ton; total kilowatt-hours generated, 27,870, averaging 42.6 per ton of refuse, and 114.69 per hour; revenue for the month at one cent per kilowatt-hour, $278.70.

MECHANICAL DRAFT.

BY CHARLES L. HUBBARD.

Among the advantages to be derived from mechanical draft is the ability to produce the required draft without regard to the outside weather conditions or the temperature of the flue gases. This makes it especially adapted for use in connection with economizers where a considerable portion of the waste heat in the chimney gases may be utilized for heating the feed water. A saving of ten to twenty per cent is often made in this way.

In the case of new plants mechanical draft does away with the building of tall and expensive chimneys, unless the plant is so located that the escaping gases must be discharged at a considerable height on account of the surroundings. In old boiler plants the power may be considerably increased by the use of forced draft at an expense considerably less than that required to install new boilers. It is claimed by the makers of apparatus of this kind that the capacity of a boiler plant may be increased from thirty to forty per cent for continuous working and considerably more for short runs. This is often taken advantage of in electric power stations where the maximum load is only required for a short time each day. It must be borne in mind that forcing a boiler beyond its normal capacity lowers its efficiency, but for short periods this is more economical than to increase the size of the plant.

Among other points in favor of mechanical draft are ease of regulation and ability to burn a cheaper grade of fuel.

The rate of combustion under ordinary conditions in the case of stationary boilers usually runs from twenty to thirty pounds of coal per square foot of grate surface per hour.

If the rate of combustion be increased in the case of a boiler running at maximum efficiency, while the grate area remains the same, the rate of evaporation per pound of coal will be reduced; but if the grate be made of such size that the total quantity of fuel burned per hour remains constant, a certain increase in efficiency will be noticed. This is accounted for by the more thorough mixture of the air with the coal and also the deeper fires which are carried. As a greater proportion of the air fed to the fire is consumed, it follows that the total quantity is reduced, which results in a hotter fire and a greater radiation of heat to the boiler surfaces. It has been found by experience that under ordinary conditions the most satisfactory results are obtained with a combustion of about 0.3 pound of coal per square foot of heating surface per hour.

This same condition should be carried out when applying mechanical draft, by reducing the size of grate as the rate of combustion is increased, thus keeping the total amount of fuel the same.

Table I gives the square feet of grate surface per horsepower required for different rates of combustion for both fire-tube and water-tube boilers. In computing this table fifteen square feet of heating surface per horsepower has been assumed for fire-tube boilers and ten square feet for water-tube boilers.

TABLE I.

Pounds of Coal Burned Per Square Feet of Grate Per Hour.	Square Feet of Grate Surface Per Horsepower. Fire-Tube Boilers.	Water-Tube Boilers.
15	0.30	0.22
18	0.25	0.19
21	0.22	0.16
24	0.20	0.14
27	0.17	0.12
30	0.15	0.11

Theoretically, about twelve pounds of air are required to burn one pound of coal. In actual practice it is impossible to do this owing to the difficulty of bringing the air in contact with all parts of the fuel, so that it is customary to supply about twice this amount in the case of natural draft and about eighteen pounds in the case of mechanical draft.

The strength of draft required in any particular case depends upon the kind of fuel, the length and size of the smoke passages and the number of bends. In the case of ordinary stationary boilers this commonly runs from one to two inches of water column.

Thurston gives the following as the average draft pressures necessary to burn different grades of fuel.

TABLE II.

Kind of Fuel.	Inches of Water.
Good steam coal	0.4 to 0.7
Ordinary slack	0.6 to 0.9
Very fine slack	0.7 to 1.1
Semi-anthracite	0.9 to 1.2
Anthracite slack	1.3 to 1.8

The three systems of mechanical draft in most common use with stationary boilers are the steam jet, forced draft, and induced draft.

In the first case the draft is produced by blowing steam and air into the ash pit. This is the most wasteful method of producing a draft, but has the advantage in the case of cheap coals high in ash, of reducing the amount of clinker formed. This is due to the decomposition of the steam into hydrogen and oxygen in the bed of the fire. A considerable amount of steam is required to operate this system.

In the case of forced draft the air is discharged into the ash pit under pressure by means of a fan. This system is most easily applied to existing plants where it is desired to increase the draft for burning cheaper grades of fuel. The air should be so introduced as to distribute the pressure evenly, otherwise air holes will be blown through the bed of the fire. The air is usually delivered through openings in the bridge wall or bottom of the ash pit near the front, the same being provided with deflecting dampers for spreading the air as it enters. One objection to this system is that the pressure within the ash pit and furnace tends to blow ashes and flame into the fire room if forced too hard, but little trouble will be experienced from this if the damper in the blast pipe is closed before opening the fire or ash pit doors.

In the case of the induced-draft system a reduced pressure is maintained in the furnace by means of an exhaust fan placed in the smoke flue between the boiler and the chimney. This produces the same effect as the natural draft of a chimney, is easily controlled and does not blow flame and dust into the fire room when the furnace doors are opened. The fans used for producing a mechanical draft are of the ordinary steel plate type with steel casing. They are commonly driven by a steam engine, either direct-connected or belted, as most convenient. The speed of the engine is regulated by the boiler pressure by means of a throttle valve in the steam pipe.

Tables III and V, published by the writer in *Power* some time ago, give the size and speed of fan, quantity of air delivered, and horsepower required for maintaining different pressures in the ash pit, when the fan is located reasonably near the boiler. Table III is for forced draft, and the air quantities are based on a velocity, through the fan outlet, of 2,000 feet per minute, and are for fans so proportioned that the width is 0.52 of the diameter, as given below in Table IV:

Should the required air volume come between the quantities given in Table III the speed of the fan may be increased or diminished for small differences, but if the variation is of considerable magnitude the width of the fan may be changed, in order to maintain the pressure.

The necessary change in width is

easily made by dividing the air volumes given in Table III by the fan widths in Table IV to determine the volume of air delivered per inch of width, and from this the required width to deliver any volume of air is readily computed.

A practical example will make the use of the tables clear.

It is desired to burn 2,400 pounds of coal per hour under a battery of boilers using a forced draft of 1.5 inches of water column. What size and speed of fan will be required and what will be the horsepower of the engine for driving it?

Pounds of coal per minute = 2,400 ÷ 60 = 40, which requires 40 × 230 = 9,200 cubic feet of air. Looking in Table III, we find that a four-foot fan will deliver 10,000 cubic feet of air at this pressure when running at a speed of 440 revolutions per minute, and require 5.4 horsepower.

In practice, we should use a fan of this diameter and standard width, and depend upon the engine regulator to run it at the proper speed to maintain the required pressure.

Suppose a case where it was desired to furnish 25,000 cubic feet of air per minute, at a pressure of 1.25 inches of water. Looking in the second column of Table III, we find a seven-foot fan will deliver 28,880 cubic feet at this pressure when running at a speed of 230 revolutions per minute and requires fourteen horsepower. From table IV we find a standard fan of this diameter is forty-three inches in width, and therefore delivers 28,800 ÷ 43 = 670 cubic feet per inch of width. As the required amount is 25,000 cubic feet, the width of fan should be 25,000 ÷ 670 = thirty-seven inches.

Theoretically, the horsepower varies as the volume of air moved, but actually the friction of the fan forms a considerable part of the load, and this would be affected but little by any slight change in width, so in practice it is best to take the horsepower directly from the table without change.

When induced draft is used, the gases reach the fan at a high temperature; hence a greater volume must be handled for a given weight, thus making it necessary to use a larger fan for the same sized plant.

Should any given fan used for supplying a forced draft be changed so as to produce an induced draft of the same intensity, the following changes would take place: (1) The speed would have to be increased in order to maintain the same pressure; (2) the power necessary to drive the fan at the increased speed would be greater than before; (3) the volume of air supplied to the furnace would be reduced.

For a flue-gas temperature of 500 degrees Fahrenheit the correction factors are as follows: Volume × 0.75; speed × 1.35; horsepower × 1.35.

TABLE IV.

Diameter of Fan Wheel in Feet.	Width of Fan Wheel in Inches.
2.5	16
3.0	19
3.5	22
4.0	25
4.5	28
5.0	31
6.0	37
7.0	43
8.0	50
9.0	56
10.0	62

For example, a six-foot fan when used for forced draft will deliver (say) 21,400 cubic feet of air at a temperature of sixty degrees and at a speed of 290 revolutions per minute will maintain an ash-pit pressure of 1.5 inches of water, and requires 11.5 horsepower. What will be the volume of air drawn into the ash pit by the same fan when used for induced draft, and what speed and horsepower will be required to maintain the same pressure?

Using the factors given above, we have: Volume, 21,400 × 0.75 = 16,050 cubic feet. Speed, 290 × 1.35 = 391 revolutions per minute. Horsepower, 11.5 × 1.35 = 15.5.

TABLE III.

Fan Dimensions, Quantity of Air and Horsepower for Maintaining Various Pressures in Ash Pit. For Forced Draft, Temperature of Air 60 Degrees Fahrenheit.

		Pressure in Inches of Water.											
		0.5		0.75		1.00		1.25		1.50		2.00		2.50	
Diameter of Fan in Feet.	Cubic Feet of Air Delivered to Furnace Per Minute.	Revolutions Per Minute.	Horsepower.	Revolutions Per Minute.	Horsepower.	Revolutions Per Minute.	Horsepower.	Revolutions Per Minute.	Horsepower.	Revolutions Per Minute.	Horsepower.	Revolutions Per Minute.	Horsepower.	Revolutions Per Minute.	Horsepower.
2½	4,200	510	1.6	560	1.8	600	1.9	640	2.1	710	2.3	780	2.5	850	2.7
3	5,800	430	2.2	460	2.4	490	2.6	530	2.8	590	3.1	640	3.4	710	3.8
3½	7,800	360	3.0	400	3.3	420	3.5	450	3.8	500	4.2	550	4.6	610	5.1
4	10,000	320	3.9	350	4.2	370	4.4	400	4.9	440	5.4	480	5.9	530	6.5
4½	12,400	290	4.8	310	5.2	330	5.6	360	6.0	400	6.7	430	7.3	470	8.0
5	15,200	250	5.9	270	6.4	290	6.8	310	7.4	350	8.2	380	8.9	420	9.8
6	21,400	210	8.3	230	9.1	250	9.6	260	10.4	290	11.5	320	12.5	350	13.9
7	28,800	180	11.2	200	12.2	210	13.0	230	14.0	250	15.5	280	16.8	300	18.7
8	37,200	160	14.4	170	15.7	190	16.7	200	18.1	220	20.1	240	21.8	270	22.5
9	46,800	140	18.1	160	19.8	170	21.1	180	22.7	200	25.3	220	27.4	240	30.3
10	57,400	130	22.2	140	24.3	150	25.8	160	27.9	180	30.1	200	33.6	210	37.2

Table V has been computed from Table III in the manner above described and may be used for induced-draft plants where the average flue-gas temperature is around 500 degrees. The use of Table V is practically the same as Table III. The volumes in the second column are for an air supply at a temperature of sixty degrees, computed in the same manner as for forced draft, while correction factors have been made for volume, speed and horsepower.

For example, a boiler plant is to be supplied with 20,000 cubic feet of air per minute; a pressure of one-inch water column is to be maintained by induced draft. What will be the required size and speed of fan, and the horsepower of the driving engine?

Looking in Table V we find that a standard seven-foot fan will draw 21,000 cubic feet of air into the ash pit and produce a pressure of one inch when running at a speed of 283 revolutions per minute. The horsepower required under these conditions is 17.5. Similar reasoning will find any other unknown.

TABLE V.

Fan Dimensions, Quantity of Air and Horsepower for Maintaining Various Pressures in Ash Pit. For Induced Draft, Temperature of Air 500 Degrees.

		Pressure in Inches of Water.											
		0.5		0.75		1.00		1.25		1.50		2.00		2.50	
Diameter of Fan in Feet.	Cubic Feet of Air at 60° Drawn Into Furnace Per Minute.	Revolutions Per Minute.	Horsepower.	Revolutions Per Minute.	Horsepower.	Revolutions Per Minute.	Horsepower.	Revolutions Per Minute.	Horsepower.	Revolutions Per Minute.	Horsepower.	Revolutions Per Minute.	Horsepower.	Revolutions Per Minute.	Horsepower.
2½	3,000	688	2.2	756	2.4	810	2.6	864	2.8	958	3.1	1,053	3.4	1,147	3.6
3	4,200	580	3.0	621	3.2	661	3.5	715	3.8	796	4.2	864	4.6	958	5.1
3½	5,700	486	4.0	540	4.5	567	4.7	607	5.1	675	5.7	742	6.2	823	6.9
4	7,300	432	5.3	472	5.7	500	6.1	540	6.6	594	7.3	648	8.0	715	8.8
4½	9,300	390	6.5	418	7.0	445	7.5	486	8.1	540	9.0	580	9.8	634	10.8
5	11,100	337	8.0	364	8.6	391	9.2	418	10.0	472	11.1	513	12.0	567	13.2
6	15,600	283	11.2	310	12.3	337	13.0	351	14.0	391	15.5	432	16.9	472	18.7
7	21,000	243	15.1	270	16.5	283	17.5	310	18.9	337	20.9	378	22.6	405	25.2
8	27,100	216	19.4	230	21.2	256	22.5	270	24.4	297	27.1	324	29.4	364	30.4
9	34,200	180	24.4	216	26.7	230	28.5	243	30.6	270	34.1	297	37.0	324	40.9
10	41,900	175	30.0	190	32.8	202	34.8	216	37.6	243	41.8	270	45.3	283	50.2

INDUSTRIAL SMOKE PREVENTION IN HAMBURG.

BY JOHN B. C. KERSHAW.

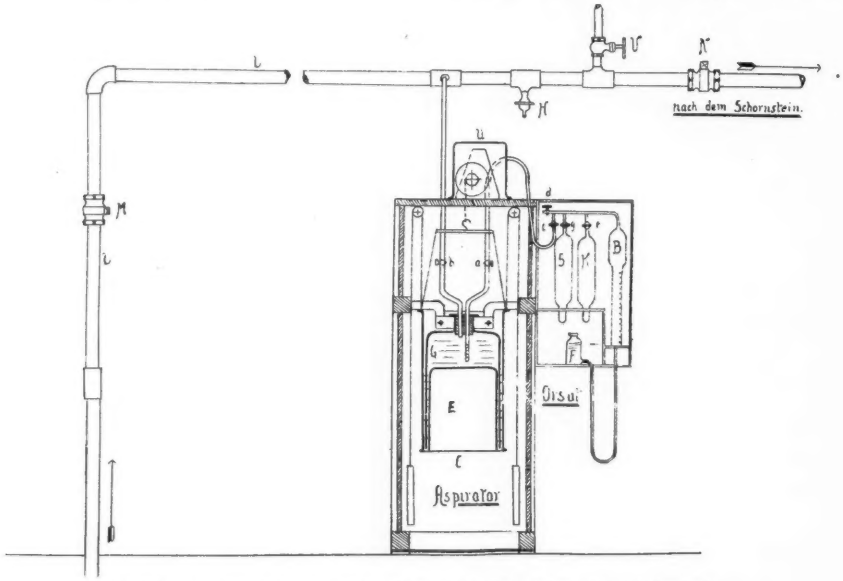
It is somewhat strange that although the United Kingdom and the United States have always led the way in sanitary science, the industrial smoke problem—which is certainly largely a health problem—has so far defied all their efforts to solve it.

If one wishes to read or hear at the present date of the most successful organized attempts to minimize the evils arising from factory smoke, one must have recourse to the publications and reports of foreign countries. Smoke-abatement societies exist, it is true, in London, and in many of the larger industrial cities of England and America. These societies draw their membership, however, not from the manufacturing element, who ought to support them, but from the professional, artistic, and literary world outside of the manufacturing industries, and the efforts of these societies toward the suppression of smoke are confined, usually, to prosecutions (too often abortive) of the most conspicuous offenders.

When our city authorities or chambers of commerce discuss the question of smoke and its evils, the reason that so little real progress has been made in clearing our atmosphere from this evil, is revealed. The larger number of fuel users in both countries still believes that smoke means wealth, and that to produce less smoke would add to the cost of running their mills and factories.

Individual manufacturers with a scientific bent of mind have no doubt freed themselves from this fallacy, and have demonstrated to their own satisfaction that a smokeless chimney does not signify either inefficiency or loss. The general body of fuel users, however, is still permeated with the idea that it cannot suppress black smoke without increasing wages or fuel bills, and with a lamentable indifference to the health and happiness of the community obliged to live within the blighting range of their factory chimneys, it continues to burn fuel on the unscientific rule-of-thumb methods, handed down from the last generation.

These reflections upon the smoke problem have been aroused in the mind of the writer by the recent appearance of



SAMPLING APPARATUS FOR FLUE GASES, USED IN HAMBURG.

two reports on this subject, one hailing from America and the other from Germany.

The first, a well-printed octavo volume of 187 pages, is Bulletin No. 373 of the United States Geological Survey.

The subject of the bulletin is "The Smokeless Combustion of Fuel in Boiler Plants," by D. T. Randall and H. W. Weeks.

The second report is equally valuable, though different in character, being the sixth annual report of the Hamburg Smoke Abatement Society. This society is a voluntary association of fuel users who own steam-raising or heating plant within or in the vicinity of the city of Hamburg. The objects of the society are: (1) To improve the efficiency of the fuel-burning plant; (2) to minimize the emission of black smoke from the chimneys of the works owned by its members. The scientific supervision of the plant by a staff of chemical engineers especially trained for this work, and the education of the stokers in the proper performance of their duties, are the two chief branches of the society's work.

The success which has attended its efforts is proved by the steady progress it has made since its birth, seven years ago.

The past twelve months has seen an accession to the register of sixty-nine new members owning 410 heating installations, and the year closed with a membership of 325, operating a total of 1,052 boilers and 148 other heating installations. The operations of the society have extended into Elsass Lothringen and Finland during the past year, forty-three of the new members owning plant outside the boundaries of the city of Hamburg. The steam-raising and heating appliances owned by the city authorities were placed under the control of the society in the year 1906-07, and this arrangement has now been confirmed by the Senate and Burgershaft of the city, an annual payment of 5,000 marks (about $1,200) being assured during the next three years, in return for the services rendered.

A new feature of the past year has been the delivery of a public course of lectures upon fuel and its combustion, by the chief engineer of the society; these lectures will shortly be published in volume form. At the instigation of the society, the Hygienic Institute in Hamburg has commenced to take records of the amount of soot and dirt in the air of the city, and it is hoped that shortly reliable and definite information and figures will be available showing the improvement in the atmosphere of the city. The body of the report contains details of a large number of the tests of the members' boiler plant, carried out before and after the overhaul and control by the society's officers and stokers.

Improved efficiencies ranging from twelve up to twenty per cent are recorded in these pages. The chief engineer emphasizes the need for constant and regular control of the operations of the firemen in order to obtain the best results, and states that over one-third of the boiler installations under their charge are now equipped with a special form of aspirator, for checking the composition of the waste gases.

The automatic CO_2 recorders are not

looked upon with favor by the society, and its engineers have adopted this special form of aspirator and testing apparatus for the control of boiler and furnace firing, in preference to the more generally employed automatic CO_2 recording apparatus, for the following reasons: (1) Automatic recording apparatus is often complicated in construction and easily gets out of order. (2) The percentage of CO_2 alone is not sufficient to enable the engineer to judge of the completeness of the combustion, or of the absence of unburnt hydrocarbon gases and of carbon monoxide.

The sampling and testing apparatus in use at Hamburg has been thoroughly tried, and is now installed on nearly 400 of the boilers under the control of the society, with most excellent results. The apparatus is shown in diagrammatic form in the accompanying illustration. The sample of gas is drawn constantly (using natural or artificial draft) from the exit flue by means of the pipe *L*, and as it passes over the aspirator *C*, a small portion of the gas flow is sucked down into this by the action of clockwork on the bell *E*. The aspirator above this bell is filled with water covered with a film of paraffin oil, and the rate at which the bell sinks and the gas is sucked into the space *G* above it, is controlled by a pendulum and simple clockwork arrangement at *U*, the speed of which can be varied to suit the length of firing shift. At the end of eight or twelve hours (*i. e.*, when the firemen change) the clockwork is stopped, and the average sample of gas stored in the space *G* is tested for carbon dioxide and for oxygen, by aid of the Orsat apparatus shown on the right-hand side of the aspirator, a rubber tube being employed to connect the aspirator and Orsat apparatus.

Two tests of the average sample of gas are made, and the aspirator is then emptied by raising the bell *E*, and by opening the taps *A*, *C* and *d*.

By closing *A* and opening *B*, and by starting the pendulum of the clockwork again, the apparatus is set for taking the next average sample, no attention being required for eight or twelve hours, according to the length of the working shift.

The pipe *L* is kept free from soot and rust deposits by blowing steam or compressed air through it at regular intervals by means of the tap at *V*, and snap samples of the exit gas can be taken when desired without stopping the aspirator, by connecting the cock at *H* with the tap in the Orsat apparatus at *d* by means of a thick rubber tube. The solutions in the Orsat apparatus are caustic potash for the CO_2 and an alkaline solution of pyrogallic acid for the oxygen—these solutions require renewal every three or four weeks. *B* is the measuring tube, *K* the caustic-potash pipette, and *S* the pyrogallic-acid pipette in the diagram.

The percentage of unburned hydrocarbons and of carbon monoxide in the exit gases, is calculated from the total percentage of carbon dioxide and oxygen, the total percentage of these two constituents, when perfect combustion has occurred, fluctuating between 19.0 per cent and 19.5 per cent, according to the kind of coal used.

The following tables show the working of the method in practice, with the basis upon which the bonus for good work and fines for bad work, are calculated:

Date.	Time.	Shift.	Fireman.	Boiler No.	Average Per Cent of CO_2.	Av. Per Cent CO and O.
June 22, 1907	6:30 a. m. to 5:30 p. m.	Day.	Muller	1 and 2	11.3	19.4
June 22 and 23	6:00 p. m. to 6:30 a. m.	Night.	Lange	2	11.0	19.5

BONUS TABLE FOR GOOD PERCENTAGES OF CO_2.

Fuel burnt, about 7,000 kilogrammes in twelve hours at sixteen marks per 1,000 kilogrammes. Temperature of the exit gases, 290 to 320 degrees centigrade.

Average Per Cent of CO_2.	Fuel Saved, in Kilogrammes.	Value of Fuel Saved, in Marks.	Bonus Addition to Wages, in Marks.
8.0	...	....	...
8.5	165	2.60	.15
9.0	360	5.75	.30
9.5	490	7.85	.40
10.0	645	10.30	.50
10.5	740	11.85	.60
11.0	900	14.45	.70
11.5	1,005	16.20	.80
12.0	1,120	17.95	.90
13.0	1,260	20.20	1.00

FINES TABLE FOR INCOMPLETE COMBUSTION.

Average Percentage of CO_2 and Oxygen.	Fuel Burnt Unnecessarily, in Kilogrammes.	Value of Fuel Wasted, in Marks.	Fine, in Marks.
19.4	..	....	...
19.0	80	1.25	.10
18.7	225	3.10	.15
18.4	315	5.00	.25
18.1	460	7.35	.35
17.8	610	9.75	.50

Similar tables can be worked out for each boiler installation, taking into account the class of fuel and the amount used per shift. With the aid of these tables the labor involved in calculating the bonus or fine for each stoker's work is reduced to a minimum, and the men are given a very real incentive to saving fuel and preventing waste. The system is stated to yield most satisfactory results.

It is greatly to be regretted that the Hamburg society's example of friendly cooperation between all the fuel users of one locality has not been copied in some English or American center of manufacturing industry, for the writer is persuaded that it is by working on these lines the solution of the industrial smoke problem will be attained. The manufacturers, however, must themselves become convinced that black smoke means inefficiency and loss, before any real progress can be made, and the rubbing-in of this truth is the first step toward the solution of the problem.

Electrical Development in Brazil.

Many of the industrial establishments in Brazil, notably those in and around Rio de Janeiro, are rapidly changing to electric power, says a recent United States consular report, as a result of the development of hydroelectric energy from a river near Rio de Janeiro. There are similar notable establishments near Sao Paulo, and to some extent near Bahia. The availability of this power is gradually working a revolution in present industrial establishments, changing them from small power, often purely handwork, to modern power establishments. The availability of electricity also is doing away with the general power problem, which has always been in the way of industrial development in Brazil. Power from fuel in Brazil has always been expensive. The country has no coal deposits worthy of the name, none able to compete with imported fuel, and imported fuel after a 7,000-mile haul is costly. Transportation and other elements added to the high cost of fuel have prevented that measure of industrial development in the country which might naturally have been expected as a result of its own local demand for products which are of ordinary manufacturing possibility in this country. With the advent of electricity much of this unfavorable condition is modified. The matters of transportation, raw materials, and cheap and efficient labor are yet to be disposed of, but some of these problems are gradually being solved.

The Aftermath.

The Interborough Rapid Transit Company, of New York, has sent a check for $5,000 to Police Commissioner Baker, as a contribution to the Police Pension Fund, in recognition of the assistance furnished the company by the police, in handling the crowds during the Hudson-Fulton Celebration.

ELECTRICAL Advertising *and* Selling

CENTRAL-STATION ADVERTISING.[1]

BY J. O. LITTLE.

II.

A form of newspaper advertising that should be given more attention is that which is classified as indirect, consisting of accounts of electrical invention, progress and activity. It is easy to prepare and distribute items of this sort. They make interesting reading, and most newspapers are not averse to running them free of charge as fillers. The omission of the central-station's name from such items does not lessen their advertising value, for if they succeed in creating a demand for more current, the business belongs perforce to the central station.

Just a word in passing about other circulating mediums. The great volume of advertising carried by magazines indicates the esteem in which they are held.

THE STREET CAR.

Street-car advertising is perhaps the closest rival of the magazine. One may cover the entire country with street-car cards or may use the cars of a single community only. This feature of localization makes the street car very attractive to the central station. It permits a display of color, it puts all advertisers on an equal basis, since all the cards are uniform in size and all are spread out in a row, and it enables the advertiser to change copy as often as desired.

Street-car rates vary from less than a cent-and-a-half to three cents per car per month, according to the locality, the number of cars used, and the length of time the contract is to run. Street-car advertising is undoubtedly one of the most profitable sources for the central station to employ, as is borne out by the results obtained by many now using space. Central stations which control trolley lines have an advantage over others in that they can reserve space for their own use when making a contract with a street-car advertising agency. This, however, is something that many have overlooked. Those who have should not fail to remedy the oversight when renewing their contracts. But whether the space is reserved or bought outright, it is undoubtedly valuable space to have. Much depends upon the attention that is given to the copy. It should be attractive and to the point. The fewer words the better, for one will remember a single sentence the first time he sees it if it is short and terse, whereas he will have to see your advertisement many times before he takes the trouble to read a whole cardful of argument in fine type.

THE DEMONSTRATION.

The special demonstration is considered by manufacturers of household appliances very generally as an effective means of introducing a new article. In the household department of the large department stores there is almost always some sort of a demonstration going on. The department store has but one advantage over the central station: customers are coming and going continually. To get them to come, the central station must advertise the demonstration through the newspapers, the street cars, or by sending out invitations or by a combination of these methods.

A good plan is to conduct part of the demonstration in the window, or all of it if the window space is large enough. Demonstrations have been made use of by a great many central stations, and the reports are generally favorable. Outside of the actual sales made, a demonstration possesses the additional advantage of making people better acquainted with your company and what it has to offer, and setting them to thinking about it.

An article like the electric iron may be carried around by the solicitor and demonstrated as he goes, but this form of demonstration is limited to existing customers, while the demonstration in the display room makes it appeal to those whose houses are not wired as well. You can't expect them at once to order their houses wired for the sake of an electric iron or a sewing-machine motor, but keep on showing what a house that is not wired is deprived of, and some day they will be won over.

HOUSE ORGANS.

Many central stations publish monthly house organs or private magazines. Some of these magazines are individual; others are bought from a syndicate which prints the same periodical for a number of stations, leaving certain portions to be filled in with local items. This plan is, of course, much more economical than the other, but the individual organ is considered by the larger central stations the better proposition of the two.

An individual magazine may be conducted along very economical lines. One of the biggest items of expense is the illustrations, and appropriate illustrations may generally be had from the larger manufacturers for the asking. Articles may be procured in the same way. An investigation of the advertising relations existing between manufacturers and dealers in other lines, as hardware, for instance, shows that the dealer depends to a large extent upon the manufacturer for advertising matter of all kinds, not only matter printed ready for display and circulation, but illustrations and reading matter, for the advertising literature printed by the dealer himself.

The central station should look to the manufacturer of electrical apparatus in the same manner and should see to it that it does not miss any of the good things that it can make use of. This applies to street-car cards, newspaper copy and illustrations and to advertising matter in general, as well as to material for the house organ. A central station that has no advertising department of its own can, by adopting this method, have at its disposal the best advertising matter going.

A house organ, to be successful, should not have its mission made too prominent, but it should have interspersed with its advertising matter items of a general nature, especially items designed to put its readers in good humor. A reader remembers this feature, and, instead of throwing away the next number as "another one of those advertising dodges," he'll more than likely put it aside to glance through at his leisure.

The success of a house organ depends

[1] Abstract of paper read before the sixth annual convention of the Michigan Electric Association, Detroit, August 19.

in a great measure upon its distribution. It should not be restricted to the list of existing customers, but a special list of prospective customers to receive it should be made up.

DIRECT MAILING.

Literature for special campaigns and for distribution in the regular correspondence takes many different forms, as the booklet, the brochure, the large mailing card, the regulation size post card, the folder, the envelope slip. Results depend more upon the literature's attractiveness than the name that it goes by. It is well, however, to watch the styles, to keep in touch with the book shops and art stores and make your advertising matter in its artistic treatment conform as much as possible to the forms of art that people pay money for. The poster picture, for instance, is in great demand at the present time; therefore the poster style applied to advertising has a strong tendency to keep it out of the waste-basket and prolong its life.

Post cards are now the rage, and so a post card of attractive appearance and of the regulation size, with your message printed in small type, has a better chance of surviving than a large mailing card. If it is attractive or unique, it stands a good chance of finding a place in somebody's collection. (There is at least one member of every family who collects post cards, is there not?) If it is sent with a letter in the place of an envelope slip or stuffer, the receiver if attracted by it is quite likely to mail it to somebody else.

Outside of campaign mailings, it is always well to have some attractive slip or card to enclose with the regular correspondence. It doesn't increase the postage, and is for this reason a very economical form of advertising.

Chicago Electrical Show.

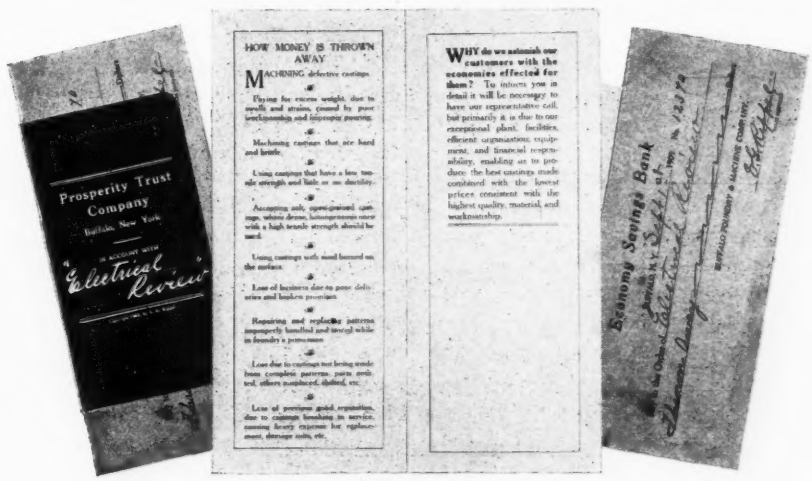
The Electrical Trades Exposition Company announces the dates for the 1910 Electrical Show, which will be held in the Coliseum, Chicago, January 15 to 29, inclusive, 1910. This show will be under the same management as the four previous annual successes, and plans are under way for booths, decorations and lighting effects which will surpass the beautiful effects of previous shows. The benefits to manufacturers, contractors and dealers derived from this annual trade booster have been thoroughly demonstrated, and indications are that the 1910 show will be participated in by all of the leading firms in the electrical field.

An Attractive Booklet.

It has been pointed out time and time again that one of the prime requisites of advertising literature, distributed through the mails, is attractiveness. A booklet, a folder, or a catalogue may contain the desired message, expressed in the most convincing terms, and should it be read would probably create the interest necessary to develop a customer, yet on account of being unattractive it will escape the notice of those to whom it is sent.

The Buffalo Foundry and Machine Company, of Buffalo, N. Y., has recently distributed a booklet, illustrations of which are shown herewith, which will undoubtedly attract attention on account of its unique style.

As may be seen in the illustrations, the booklet represents a bank book having a number of checks inserted between the pages. The covers represent those of an ordinary bank book both in size, in color and in the reading matter thereon. The outside reading pages extend out from the cover and are about the size of the regular bank checks, the first page being an exact reproduction of a check.


Prosperity Trust Company
Buffalo, New York
IN ACCOUNT WITH
"Electrical Review"
HOW MONEY IS THROWN AWAY
MACHINING defective castings.
Paying for excess weight, due to swells and strains, caused by poor workmanship and improper pouring.
Machining castings that are hard and brittle.
Using castings that have a less tensile strength and ductility.
Accepting soft, open-grained castings, where dense, homogeneous ones with a high tensile strength should be used.
Using castings with sand burned on the surface.
Loss of business due to poor deliveries and hapless promises.
Repairing and replacing patterns improperly handled and stored while in foundry's possession.
Loss due to castings not being made from complete patterns, parts omitted, others misplaced, shifted, etc.
Loss of previously gained reputation, due to castings breaking in service, causing heavy expense for replacement, damage suits, etc.
WHY do we astonish our customers with the economies effected for them? To inform you in detail it will be necessary to have our representative call, but primarily it is due to our exceptional plant, facilities, efficient organization, equipment, and financial responsibility, enabling us to produce the best castings made combined with the lowest prices consistent with the highest quality, material, and workmanship.
Economy Savings Bank
BUFFALO FOUNDRY & MACHINE CORP.

ATTRACTIVE ADVERTISING BOOKLET.

The booklet is attractive in appearance and will undoubtedly be read by those to whom it is sent.

To add to the realistic appearance the name of the firm or person to whom this booklet is sent, is inserted in the customary place on the cover and on the check.

Aeroplane Inventions.

The American Aeroplane Company, of Wilmington, N. C., has been incorporated by some of the leading business men of that town, to manufacture an aeroplane invented by local inventors. It is announced that the official test of the new machine of the Wilmington inventors will be made on the occasion of President Taft's approaching visit. L.

Advertising in Season.

It is incumbent on central stations not only to solicit new customers, but also to increase the revenue from old ones. In connection with this phase of new business campaigns, an account of the method in use by the Denver Gas and Electric Company of Denver, Colo., may prove to be a valuable suggestion.

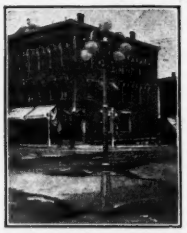
Each month they send out to their customers an attractive calendar for the current month containing a timely advertisement of a domestic appliance, such as portable stoves in October and November; suggestions of Christmas gifts in December, and electric fans in summer. Accompanying the first calendar of the series is a letter calling attention to the fact that a calendar is to be sent each month, and also advising the recipient to co-operate with the company in the matter of improving the service. As is also mentioned in the letter, the pictures on the calendars are the work of some of the leading artists, making the souvenir an article which should win a permanent place in the homes of the customers.

Emerson says, if you make a better mouse trap than has ever been made before, no difference if your cabin be in the backwoods, the world will make a beaten path to your door.

This is true, provided you find some method of letting the world know about it; in other words—advertise.

The Edison Light and Power Company, of Wichita, Kan., some time ago advertised "Electric Burglar Insurance, 50c a month," this being two two-candle-power lamps installed over the front and rear porches, respectively, to burn all night. The scheme proved very profitable.

ELECTRIC LIGHTING and ILLUMINATING ENGINEERING



New York Section, Illuminating Engineering Society.

The first fall meeting of the Illuminating Engineering Society was held on Thursday, October 14, at the Engineering Societies Building. The papers read at the recent convention were presented in abstract and discussed. Upon taking the chair, E. L. Elliott stated that the meeting on November 11 would be given over to a discussion of the subject as to the status of illuminating engineering and the report of the committee on division of membership would be presented at that time.

The first of the convention papers to be discussed was that by H. Thurston Owens on "The Progress of Illuminating Engineering in Europe." In reply to a question by Mr. Rowe, the author stated that high-pressure gas was being gradually introduced in buildings and that a number of large installations were already in use. Mr. Lansingh desired to know as to whether window-lighting, especially in London, had been improved during the past year, and the author replied that the lighting was quite in keeping with the window dressing, which could not compare in any way with the American standard.

Mr. Marshall's paper on "Diffusing Mediums" was then taken up, and Mr. Owens stated that the best way to overcome the cold light from an enclosed arc lamp with an opal globe was to change the luminant rather than the glassware, and that both flaming and magnetite lamps were in use now in New York city, and the color value could readily be compared.

In the discussion of Mr. Ives' paper on "Allowable Frequencies in Incandescent-Lamp Work," Mr. Millar stated that from tests made some time ago it was found that with a 100-watt tungsten lamp at twenty cycles the flicker was not any more objectionable than with a twenty-five-watt lamp at twenty-five cycles. Further, that a lamp on low frequency in the line of vision was not as bad as one hung so that the light reached the eye at a large angle. The critical frequency increases with an increase in voltage. Mr. Sweet then called attention to the number of elements entering into the question of flicker, and considered it an all-important topic, owing to the many cases where it was desirable to utilize current of low frequency. Mr. Millar stated that it is proposed to run Moore tubes on different phases and that some time ago a carbon lamp was sent to him for test with three filaments to be operated on a three-phase circuit.

The next paper taken up was that by Dr. Louis Bell on "Principles of Shades and Reflectors," and in discussing this the chairman stated that the fallacious theory that reffectors could be designed upon the laws of geometric optics without respect to the material with which the reflector was made, was still believed in and that if anyone wished to make calculations along these lines it would be well for him to obtain a copy of De Grand's patent, which is now over a hundred years old. He also called attention to the fact that a fluted surface will not reflect as much light as a smooth one, owing to the absorption, but notwithstanding this fact reflectors are being placed upon the market constructed in this manner.

The next paper brought up was that by A. J. Sweet on the "Standard Relation of Light Distribution," and the discussion covered a wide range, owing to the fact that the author had made a plea for more work of real value to the layman and also an attempt on his part to present some data.

Those entering the discussion were Messrs. Wohlauer, Lansingh, Owens, Millar, Marshall, Elliott, Codman and Rowe.

The paper by L. B. Marks on "Factory Lighting" and that by A. L. Eustice on "Operating Efficiencies of Commercial Installations" were also discussed, and although the meeting was only attended by a comparatively small number, the discussion on these papers had to be curtailed owing to the lateness of the hour before these subjects were reached.

Counter Electromotive-Force in the Electric Arc.

In the *Physical Review* for September, C. D. Child, of Colgate University, contributes an article under the above heading, of which the following is the author's summary:

"A review of the literature on the subject of the counter electromotive-force of the electric arc shows that this expression has been used with several different meanings, and the most recent meaning is not the same as that given to the expression when applied to a cell or an electric motor.

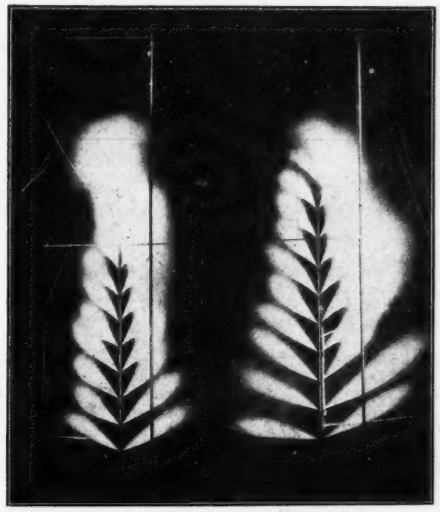
"A review of the literature on the residual electromotive-force of the arc shows that the majority of experimenters have found such an electromotive-force, whose value was somewhat less than one volt. This electromotive-force has been explained as being due to the difference in temperature of the electrodes. This was tested by cooling the anode by three different methods and the results were in harmony with such an explanation."

Test of Color Value of Moore Tube.

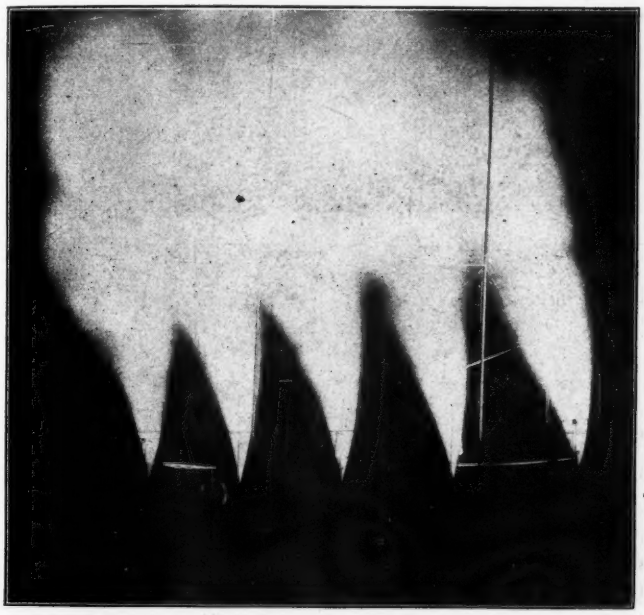
During the month of June last a series of tests of the color value of the Moore carbon-dioxide tube were made by Dr. H. E. Ives at the Bureau of Standards, Washington, D. C. These tests showed that the light of this tube contained relatively more blue than the light from the sky near the horizon, and very much less blue than the light from the zenith when the sky is clear. It follows from this that the Moore carbon-dioxide tube would be found to contain the same proportion of blue to red as the light from the sky at some altitude between the horizon and the zenith when the sky is clear, the particular altitude depending upon how dry the atmosphere is at the time of the measurement. In other words, the carbon-dioxide tube is nearly the average of the light from the clear sky, but as this varies from time to time, according to the clearness of the sky and the dryness of the atmosphere, it is impossible to give the value of average daylight in exact figures.

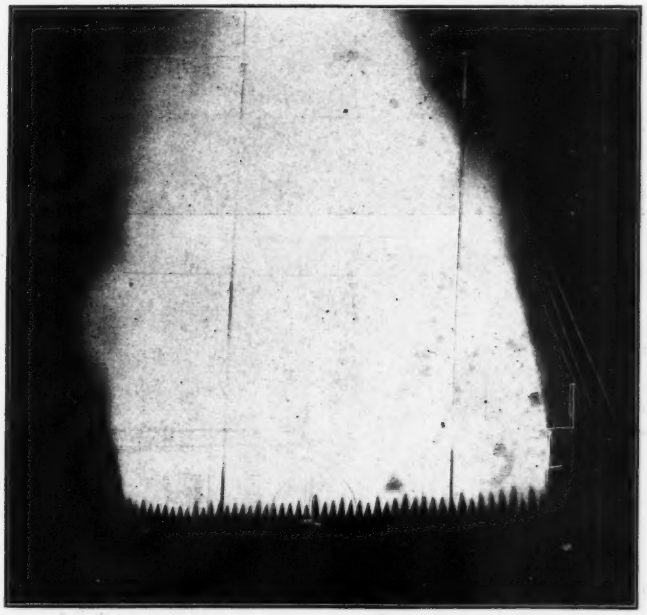
The Ryan Scintillator.

Of all the striking features of the Hudson-Fulton Celebration that was just held in New York and other cities along the Hudson River, the most spectacular and at the same time the most beautiful and original display was that which was made nightly by the Ryan scintillator equipment that was installed in New York on Riverside Drive at 155th Street overlooking the Hudson.



By installing the long row of searchlights at a prominent point in the roadway some 120 feet above the adjoining railroad yards, opportunity was afforded for an unobstructed field of action so that the brilliant display could be observed for miles along and on both sides of the Hudson. The result was that immense crowds of people were entertained nightly without discomfort and to the best advantage.

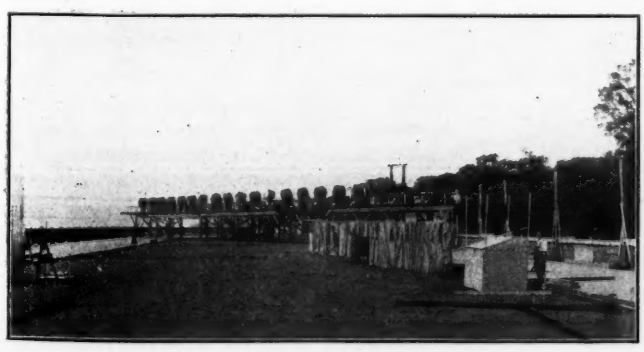


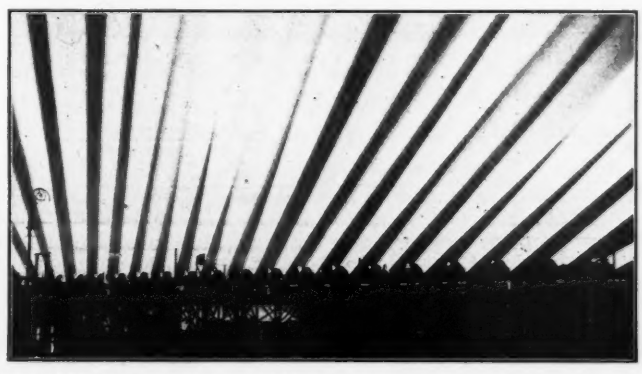


THE STEAM CURTAIN OF THE RYAN SCINTILLATOR, SHOWING EFFECTS PRODUCED BY VARIOUS NOZZLES.

The general arrangement of the searchlights is shown in the accompanying day view of the installation. Adjoining each arc projector was mounted a set of color screens on a rotatable disk on the principle made use of in electric fountains. In fact the scintillator is an adaptation of the electric-fountain idea but on a very much grander scale and making use of clouds of steam and light smoke instead of sprays of water on which to throw the powerful beams from the arc lamps. The screen produced by the steam could be varied in a great many ways by using selected sets of pipes containing a great many nozzles. This is shown by some of the views. The equipment of steam pipes consisted of both horizontal and vertical pipes, some of the latter being 100 feet high. The pipes were placed about 100 feet in front of the projectors. Steam was supplied from a separate 200-horsepower boiler. Besides using steam the curtain was augmented by burning powder near the nozzles and by the explosion of bombs.

For supplyng the direct current at seventy volts for the arc projectors a set of step-down transformers and two 200-kilowatt rotary converters were specially installed by the New York Edison Company. The control of the lamps was much more perfect than that of the steam and smoke curtain. Occasionally gusts of

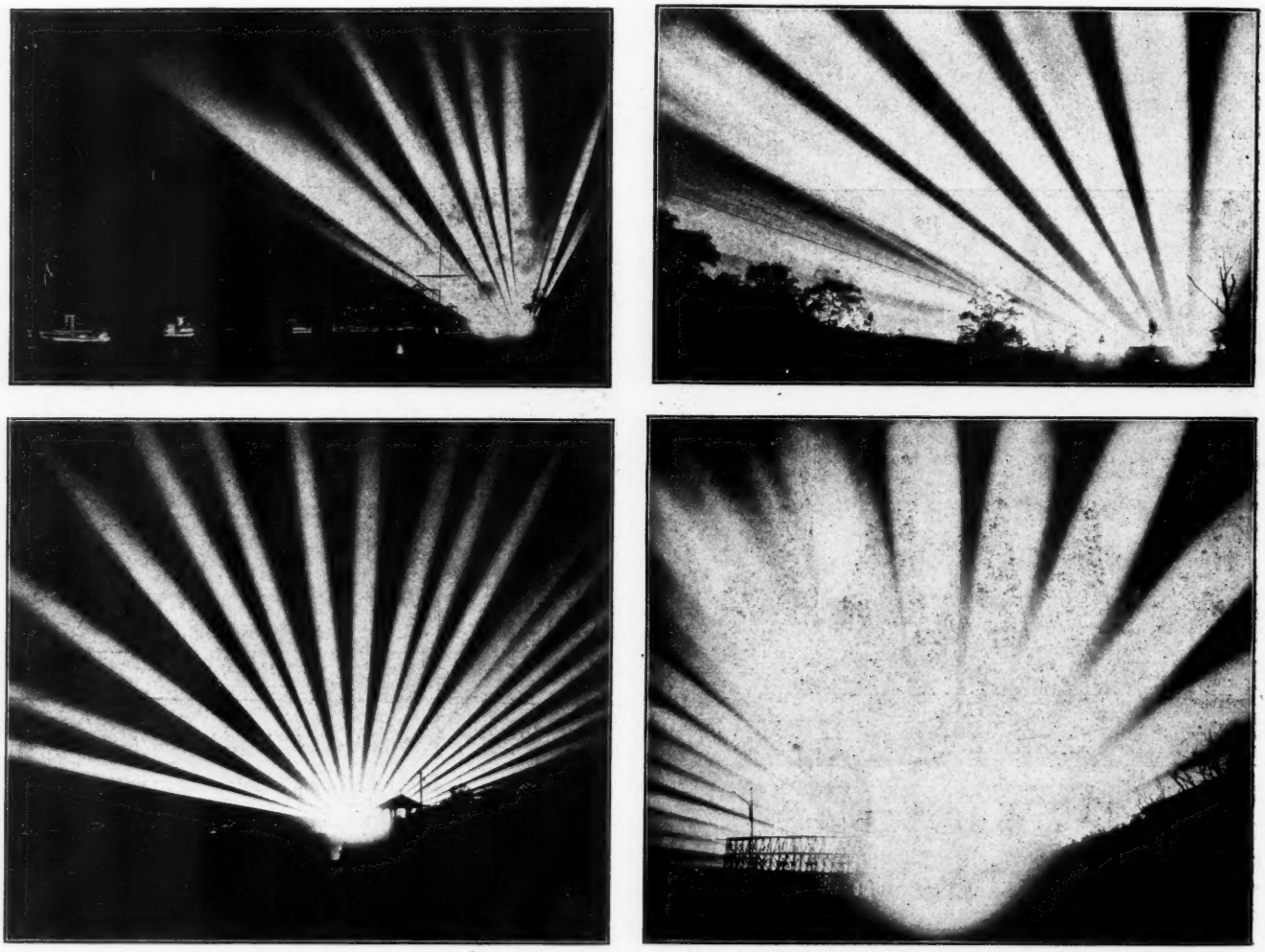




NEAR VIEWS OF THE RYAN SCINTILLATOR BY DAY AND BY NIGHT.

wind would break its continuity and thus slightly mar the resultant effect.

A number of set pieces, including a reproduction of Hudson's ship, the Half Moon, were features of the programme that was carried out hourly every evening during the week of the New York celebration. Some of the most beautiful effects were obtained by the skillful manipulation of the color screens. From a riot of color would be produced a perfect blending and harmony of hues. A striking feature was the production of magnificent auroral effects, some of which are illustrated here so as to give a suggestion of what was witnessed near by.



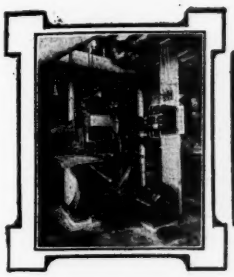
SOME OF THE AURORAL EFFECTS PRODUCED BY THE RYAN SCINTILLATOR AT THE HUDSON-FULTON CELEBRATION.

The first use of the Ryan scintillator was made at Niagara Falls about two years ago. Since then it has been improved by its inventor, W. D'A. Ryan. Its recent use in New York has shown its great possibilities as a spectacular entertainer of magnificent proportions to a degree not heretofore recognized. Already plans are being made for its use in connection with other great carnivals and electrical displays.

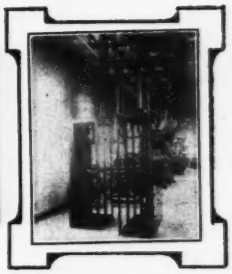
Cleanliness of Light Sources.

In the paper on "Diffusing Mediums" that was read by Albert J. Marshall before the recent annual convention of the Illuminating Engineering Society in New York, Mr. Marshall casually referred to the great importance of keeping light sources clean, but did so in such a convincing manner that his words deserve repetition:

Did you ever stop to think how much attention is given to the cleaning of windows (not to mention other articles) in an office building, the combined area of which would perhaps represent several hundred thousand square feet of surface to be cleaned, and how little attention is given to the cleaning of the artificial lighting units, the combined area of which is many times smaller than the window area? It seems odd, doesn't it? Windows are cleaned for two principal reasons: First, appearance; and second, so that they will permit light rays to enter the space in which they are used. If so much thought is given to the appearance of windows, why should not similar thought and effort be given to the appearance of artificial luminants? The existence of dirt in either case is about equally apparent and objectionable. As to the second reason for cleaning of windows, it should be considered that natural daylight is about as free as the air one breathes, and if so much attention is given to saving something which costs so little, why should not as much attention be given to the care of artificial luminants, which cost actual dollars and cents to produce and maintain? In residences, there seems to be no good reason why the glassware on a buffet or the pictures on the wall should receive any greater favors as to cleaning than the luminant and its accessories, especially when it is remembered that the luminant is the medium which permits of seeing the objects in the room at night. It is remarkable, though, how little attention, even in homes, is given to the cleaning of lighting units. In offices and public buildings it should be the duty of some person or persons to see that the lighting equipment is regularly and systematically cleaned.



Industrial Power



INSTALLATION, OPERATION, CARE AND REPAIR OF ELECTRIC MOTORS IN INDUSTRIAL OPERATIONS.[1]—I.

BY C. E. DANIELS.

Electric motors of small and moderate capacity are nearly always shipped from the manufacturers' works completely assembled, ready to set on the foundations. The small sizes are boxed and the moderate sizes crated. Large sizes, too heavy to handle conveniently as complete machines, are shipped in sections with complete instructions for assembling.

When unpacking and handling the machines or parts, they should be carefully guarded from severe shocks or blows. Completely assembled machines, above the very small sizes, are generally provided with eyebolts, or bails, and whenever possible these should be used for lifting the machines in preference to slings placed elsewhere. Castings at very low temperature are easily broken; it is better to raise their temperature above the freezing point of water before handling them.

All electrical machinery not especially constructed to resist injury by moisture should be kept dry. If a machine has been inadvertently exposed to moisture, the windings should be thoroughly dried before being subjected to the full stress of normal working conditions. This is true of nearly all machines that have been in storage or have been idle for some time and is particularly true of new machines that have been long in transit. Small motors can be baked in ovens, and all sizes can be dried by passing a limited current, say one-half the normal current, through the windings. This current can be adjusted by means of rheostats or other similar resistances.

Location.—For best results an electrical machine must be located in a clean, dry, well-ventilated place, easily accessible and in plain sight. These ideal conditions are not always possible; nor are all of them absolutely essential to successful operation, but all are desirable. The machines must not be placed under steam or water pipes or otherwise exposed to dripping moisture. They must be kept as free as possible from grease and dirt unless special provision is made in the motor construction to prevent injury from these sources. Freedom from acid fumes is essential, and the machine must not be exposed to excessively high surrounding temperature.

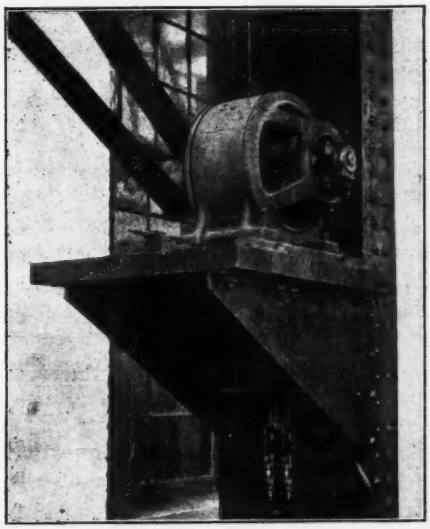


FIG. 1.—BELTED DIRECT-CURRENT MOTOR. SHELF IS UNNECESSARY AS THE MOTOR FRAME COULD HAVE BEEN TURNED IN THE BRACKETS AND THE FEET BOLTED TO THE VERTICAL SUPPORT.

Foundation.—The foundation must be solid enough to prevent vibration. Solid masonry or concrete makes the best foundation, but wood framework or timber can be used. Opinions differ as to the wisdom of insulating the motor frame from ground; where this is required, the slide rails or bedplate should be bolted to a timber framework which in turn is bolted to the foundation. The heads of all wood-frame holding bolts must in this case be countersunk in the timber, and those on the upper side must be covered with insulating compound. All timber or woodwork used for insulating purposes must be well coated, or filled, with moisture-repelling wood filler and must be kept clean and dry. Wall or ceiling supports for motors must likewise be rigid. Iron or wood uprights or stringers are generally used.

Erection.—A crane or chain hoist is usually essential for all machines weighing more than one or two hundred pounds. A chain hoist can be attached to the framework of the building or to suitable trusses. By means of the eyebolts or bails, or if necessary, by slings, set the machine on its foundation and line up the driving connection. Driving and driven shafts must be parallel; pulleys must be in line so that the belt will run true; the driving pinion and the gear must mesh properly, or if direct-connected, the shafts must be in line. Full assurance that the pulleys are properly alined can be obtained by temporarily installing the belt and turning the pulleys by hand where this is possible. When the alinements are accurate, securely bolt the slide rails, bedplate or the machine itself, to the foundation.

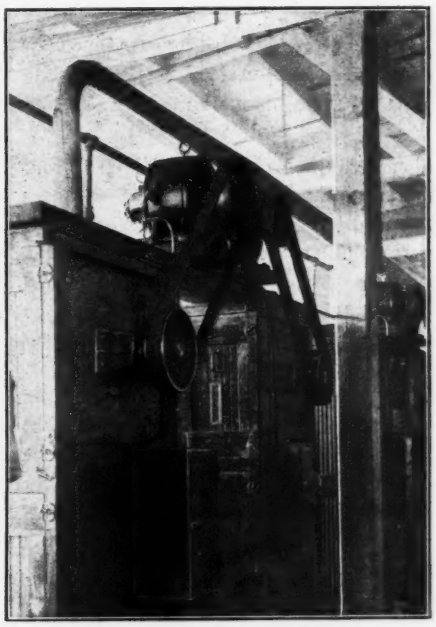


FIG. 2.—DIRECT-CURRENT MOTOR BELTED TO HOSIERY DRYER IN KNITTING MILL.

Wall and Ceiling Mounting.—Motors

[1] The writer is indebted to the courtesy of the Westinghouse Electric and Manufacturing Company, Pittsburg, Pa., for the photographs used to illustrate this article.

intended for mounting on the floor, wall or ceiling, at the option of the user, generally have bearing brackets or housings which can be turned through ninety or 180 degrees, respectively. The motors are shipped for floor mounting unless otherwise specified. For wall or ceiling mounting the bearing brackets or housings must first be turned through the corresponding angle. In most cases the bedplate or slide rails should be attached to the motor, which should then be hoisted and bolted into place. If head room is limited or hoisting facilities poor, it may be better to fasten the rails or bedplate to the supports before hoisting the motor to the place where it is to be secured.

Vertical Motors.—In general, all vertical motors must be mounted so that the inclination of the shaft from vertical is not over twenty to twenty-five degrees, and must be securely bolted to the foundation. In some cases no inclination whatever is allowable, and in case of doubt the manufacturers should be consulted. Especial care must be exercised in alining the motor shaft with the driven shaft, so as to prevent binding of the motor shaft in the guide bearings and to bring equal pressure to bear on all the balls of the thrust bearing.

Bearings.—An inferior quality of oil or grease must not be used to lubricate the bearings; such will endanger the safety of the bearings and prove far more expensive than good lubricant. Good lubricant, even at slightly higher first cost, but resulting in reliable motor service, is much more profitable than a cheap poor quality and overheated and possibly ruined bearings. The best grade of oil to use depends somewhat on the temperature in which the motor operates, heavier oil being preferable in very warm places.

Bearings of the ring-oiling type should be filled to the top of the overflow plugs with a good grade of dynamo oil. If possible turn the shaft by hand and see that the oil rings rotate. Openings are usually provided in the tops of the bearing housings through which the bearings can be filled and the rings observed. These openings are fitted with lids which should be kept closed under normal operating conditions. Extreme care should be taken to keep all gritty substances, dust, dirt, etc., out of the bearings and oil wells. This caution is especially necessary if the bearings are dismantled for any purpose.

Bearings using oil and waste must be packed with a high-grade wool waste which should fit closely against the shaft; cotton or cheap wool waste soon becomes soggy and settles away from the shaft. The waste must be thoroughly saturated with oil, preferably by immersing it for at least forty-eight hours and then allowing it to drip on a rack for ten or twelve hours. Too much free oil in the waste results in overflow and accumulation of

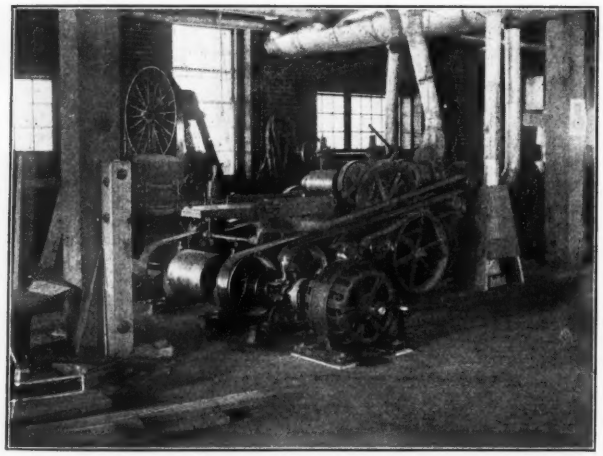


FIG. 3.—FLOOR-MOUNTED ALTERNATING-CURRENT MOTOR DRIVING A PLANER AND MATCHER.

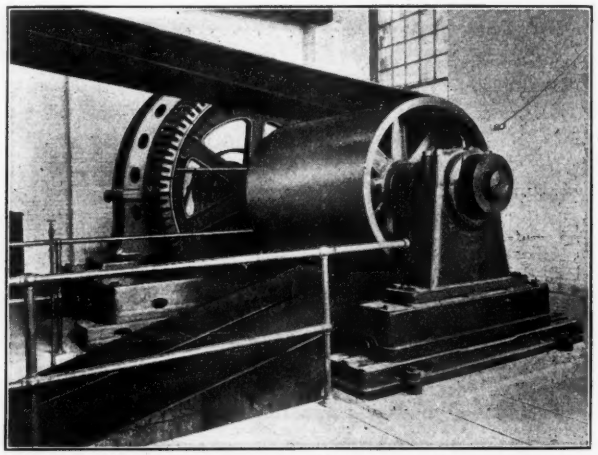


FIG. 4.—600-HORSEPOWER ALTERNATING-CURRENT MOTOR BELTED TO AIR COMPRESSOR.

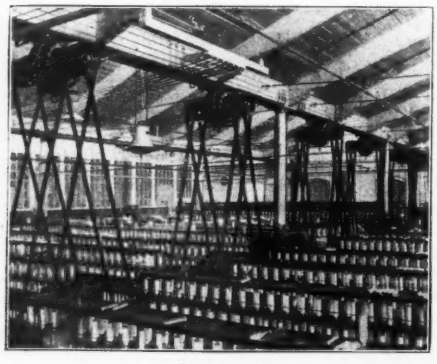


FIG. 5.—CEILING-SUSPENDED ALTERNATING-CURRENT MOTORS, EACH BELTED TO FOUR SPINNING FRAMES.

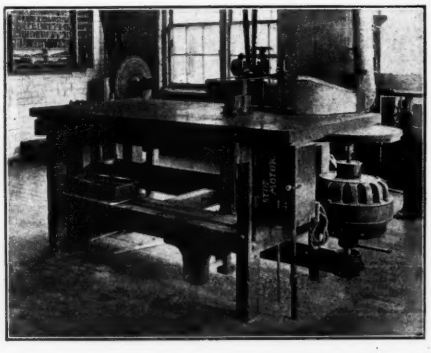


FIG. 6.—VERTICAL ALTERNATING-CURRENT MOTOR OPERATING A SHAPER.

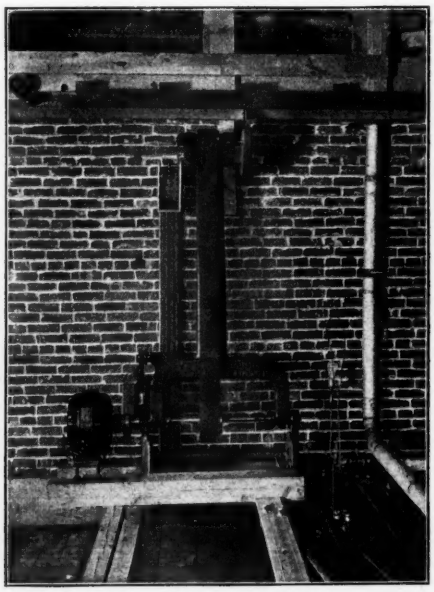


FIG. 7.—CEILING-SUSPENDED ALTERNATING-CURRENT MOTOR OPERATING CUT-OFF SAW.

oil on the equipment or possibly oil in the motor. Bearings using grease should be filled with a good quality of grease which should be free of dirt or gritty substances.

Vertical thrust bearings should always be of a type in which the bearing surfaces are liberally flooded with oil. With the exception of small motors, ball thrust bearings are the rule for vertical motors. The balls usually run in an oil bath. Provisions should also be made for keeping the guide bearings liberally supplied with oil.

Belting.—If possible the lower side of the belt should be the driving side. The distance between pulley centers should be great enough to allow some sag in the upper side of the belt, or an idler pulley

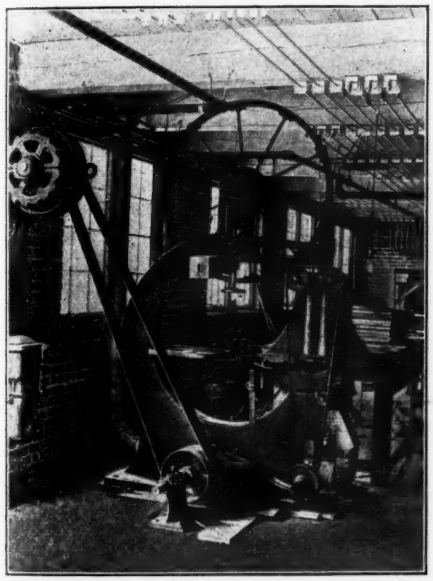


FIG. 8.—WALL-MOUNTED ALTERNATING-CURRENT MOTOR BELTED TO BAND SAW.

should be used to increase the arc of contact. The following general rules from Kent's Mechanical Engineers' Pocket-Book will serve as a guide, although these rules are very conservative, and many exceptions to them will be found in good practice:

1. Narrow belts over small pulleys—Fifteen feet between pulley centers, the loose side of the belt having a sag of one-and-one-half to two inches.
2. Medium-width belts on larger pulleys—Twenty to twenty-five feet between pulley centers, with a sag of two-and-one-half to four inches.
3. Main belts on very large pulleys—Twenty-five to thirty feet between centers, with a sag of four to five inches.

If the distance is too long the belt will flap unsteadily, resulting in unnecessary wear of both the belt and the bearings; if too short, the severe tension required to prevent slipping will cause rapid wear of bearings and may cause them to overheat. Very short belts can be made to work satisfactorily by the aid of idler pulleys, which increase the arc of contact.

The most desirable angle of the belt direction is not over forty-five degrees from horizontal; the belt should never run vertical, if possible to avoid it, since the advantage of sag to increase the arc of contact is then lost. The pulley should be a little wider than the belt.

Belts should be run with the least tension required to prevent slipping or flapping. The slack side should have a gently undulating motion. Lateral movement of the belt on the pulley indicates poor pulley alinement or unequal stretching of the edges of the belt. Belt joints should be as smooth as possible, and a lapped joint should trail rather than lead over the pulley. Belts should be kept clean and dry; if any belt dressing is applied let it be very sparingly.

Electrical Connections.—A diagram of external connections and full instructions for making them are generally supplied with each motor and with the starter where such a device is required; if these instructions are not supplied with the apparatus, they can almost always be obtained of the manufacturers on request. All connections should be made mechanically and electrically secure. The terminal wires must be securely soldered into the connectors when these are supplied with the motors and starters, and the connectors must be firmly bolted or clamped together. If no connectors are supplied, especial care must be used in joining the wires securely together and in soldering and taping the joint.

The National Electrical Code rules require that each motor and its starter be protected by fuses or a circuit-breaker and controlled by a switch which must plainly indicate whether "on" or "off." The switch and cut-out (fuses or circuit-breaker) are preferably located near the motor and in plain sight of it. All wiring should be neat and workmanlike and the wires should be run in conduit wherever possible.

All switches should be open and the starters or controllers in the off position when the motor is not running. Circuit-breakers should usually be set to open at a current about fifty per cent greater than the full-load current of the motor, although this setting must be varied to suit special conditions.

Operation and Care.—In general, electric motors must be kept clean and dry; cleanliness and freedom from dripping water, oil, grease, dirt, etc., are very important. Keep all such articles as tools, bolts, oil cans, etc., in their proper places and not lying loosely around the motor or on the motor frame.

After the motor is mounted and all mechanical and electrical connections are completed a final careful inspection should be made before starting. When satisfied that all instructions have been fully complied with, the motor should be started either without load or with light load. Instructions for starting and stopping are supplied with the motor or with the starter. Unsatisfactory operation, electrically or mechanically, when first starting is the signal that some error in assembling, mounting or connecting has been made, and the error should be found and corrected at once.

When first starting a motor particular attention must be given the bearings to see that they are well supplied with oil or grease. In bearings of the ring-oiling type, the rings should revolve and carry oil to the tops of the journals. Vertical motors should not be started until oil from the oil cups has passed through the bearings and begins to drip from the drain pipe. It is well to allow a new motor to run for an hour or two with light load, watching the bearings closely for any indications of overheating. The bearings of good modern motors with proper care, will seldom give trouble from heating. They can, however, be made to overheat by any of the following causes: (1) Excessive belt tension; (2) insufficient lubrication, which may be owing to poor lubricant, insufficient lubricant, failure of oil rings to revolve, or poor grade of waste in oil and waste bearings; (3) poor alining or leveling causing excessive end thrust or binding; (4) rough bearing surface which may be caused by careless handling or the presence of dirt or gritty substances in the oil; (5) bent shaft.

A motor bearing is usually safe if it operates at a constant temperature below the boiling point of water. The rapid rise of temperature toward this limit, however, is a danger signal calling for prompt attention. In the absence of a thermometer, a dangerously hot bearing can be detected partly by the sense or feeling (though it is usually safe when hot enough to burn the hand held continuously against the outside a few seconds), and partly by the smell of burning oil and the

appearance of smoke. It will seldom be necessary to do more than to supply the bearing with an abundance of fresh, clean lubricant, observing that the oil or grease reaches the bearing surface, and perhaps to move any excessive belt tension. If relief is not thus afforded, pour a heavy lubricant directly on to the journal, if possible. Remove some or all of the load, if necessary, but keep the rotating part in motion enough to prevent the bearing from becoming set or "frozen."

In normal service the old oil should be withdrawn from ring-oiling bearings occasionally and fresh oil substituted, running enough of the fresh oil through the bearings to wash out all sediment. The old oil, as well as that used for rinsing, can be run through a good filter and used again. A good oil filter is a necessity in every plant where much machinery is in use. The frequency with which the bearings must be refilled depends so much on local conditions, such as the severity and continuity of the service, the room temperature and state of cleanliness, etc., that no definite instructions can be given. Oil and waste bearings must also be cleaned and filled with fresh waste occasionally, as the old waste gradually becomes glazed. If such a bearing becomes overheated it should usually be repacked at once. The chief care with grease lubrication is to keep the cups well filled with clean grease and to see that the grease feeds properly to the bearings.

[To be continued.]

Government Goes into Electric Power Business.

Secretary of the Interior R. A. Ballinger has approved a contract whereby the United States Reclamation Service agrees to furnish to Spanish Fork City, Utah, electricity for lighting purposes in amount not to exceed 65,000 kilowatt-hours per month at the rate of eight-tenths of a cent per kilowatt-hour. This lighting will be furnished from surplus power developed at the power plant of the service on Strawberry Valley irrigation project. The power plant is located at a drop in one of the main canals on the project and was built primarily for the purpose of developing power for utilization in the excavation of Strawberry Tunnel.

The government has also started delivering power to the Pacific Gas Electric Company from the Roosevelt dam for the lighting of Phœnix. This company is the first patron of the government for power, the proceeds going to the fund of the Salt River Reclamation Project.

The Cost of Power.

Here is a bald statement of facts as published in the *Courier* of Bristol, Tenn. The statement and quotation from the paper follow:

Electricity is rapidly displacing steam for power purposes in Bristol, since it has been shown by actual tests of disinterested parties that it is about fifty per cent cheaper, besides eliminating the expense of depreciation of machinery and repair bills. It possesses greater efficiency, cuts down the insurance rate and is vastly more economical. The consumer pays for the exact amount of power used and no more. Besides costing only about half what steam power costs, it possesses advantages over steam or other kinds of power in a dozen ways.

The Bristol Gas and Electric Company now has one of the finest electric plants in the South, with mighty turbine engines and a duplicate plant that precludes the possibility of delays. Many steam plants have already been taken out and replaced by electricity and it will only be a short time until practically all of the power in Bristol will be electric.

The company has just received the following interesting letter, which demonstrates all that is claimed for electric power:

Bristol, Va., Oct. 4, 1909.

Mr. S. M. Vance, General Manager Bristol Gas and Electric Company, Bristol, Tenn.

Dear Sir:—Relative to your inquiry regarding the installation and cost of operation of our electric plower plant, which we installed about a month ago, we herewith submit you the following data:

We were operating a steam engine to drive our entire foundry and machine shops. We displaced this engine with electric motors, and we find that with the installation of the electric motor drive, all dirt, dust and noise relative to such a plant has been eliminated.

As to our cost of operation we beg to state that the results are far beyond our expectations. Below we give you cost of operation for one month, showing the difference between the cost of operating steam power and the cost of operating with electric power:

STEAM POWER.

Engineer	$36.40
Coal	26.00
Oil and waste	5.00
Total	$67.40

ELECTRIC MOTOR POWER.

Total cost of power consumed	$25.60
Oil and attention	12.00
Total	$38.10

The above shows a saving of nearly fifty per cent in favor of the electric motor installation.

We are well pleased with the outfit and will be glad to show our plant in operation, at any time, to any persons using power.

Yours very truly,
Dixie Foundry and Machine Works.

Determining Stresses by Electricity.

At the recent Copenhagen congress of the International Association for Testing Materials, E. Rasch described a method for determining elastic stresses and the elastic limits of metals by thermo-electric measurements. This method, which has been worked out during the last few years at the Royal Testing Laboratory, Gross Lichterfelde, near Berlin, makes temperature determinations of specimens under test by means of thermo-couples.

The author mentioned that he has used couples of silver-constantan, copper-constantan, and iron-constantan, consisting of wires about a metre in length and half a millimetre in diameter, soldered with a soft solder or with silver. A sensitive galvanometer of small period and comparatively small resistance is required, a mirror galvanometer being quite suitable.

A special thermopile has been provided for practical work. It consists of an ebonite box which is clamped with its front to the surface of the rod. This front is formed by a plate of soft rubber, fitted with a longitudinal slit in the center. Within this slit the nine thermo-junctions are so arranged in series that they do not come in contact with the surface of the rod; otherwise the soldered junctions would be short-circuited by the rod. The cold junctions are connected with the binding screws at the back of the box to which the galvanometer leads are joined.

Some astonishing results were obtained with this device, which recorded distortions of test specimens not sensibly recorded by the usual forms of autographic stress-recording apparatus. The thermo-electric method has proved effective in determining fiber stresses in beams, etc., extended fibers being recognized by a fall, and compressed fibers by a rise, in temperature.

Great Britain had, at the close of 1908, a total of 204.5 miles of electrified steam-railroad track operated solely by electricity, and in addition 200.5 miles partly operated electrically.

New York Meeting of the American Electrochemical Society.

The autumn meeting of the American Electrochemical Society will be held in New York city from October 28 to 30, that is, the last Thursday, Friday and Saturday in October.

The convention will be opened by a professional meeting in the Chemists' Club in the afternoon of Thursday. Besides a number of papers to be presented and discussed, there will be a general experimental lecture by Prof. Edgar F. Smith, of the University of Pennsylvania, on recent developments in electro-analysis.

On Saturday morning and afternoon, two sessions devoted to the reading and discussion of papers will be held at Columbia University.

The whole of Friday will be devoted to an excursion to Bayonne, N. J. Members and guests (without ladies) will meet in the waiting room of the station of the Central Railroad of New Jersey, in Jersey City, at 8:30 a. m. (This station can be reached from New York by ferries either from Liberty Street or Twenty-third Street, not in any other way.)

A special train will take the party to the Constable Hook Section in Bayonne, where the forenoon will be spent. In the afternoon, plants in the Newark Bay Section of Bayonne will be visited.

At noon luncheon will be served at one of the shore resorts on the Kill von Kuhl. The mayor of Bayonne, Hon. Pierre P. Garven, will there welcome the society to Bayonne.

So far the following companies have given permission to visit their plants:

Standard Oil Company.

National Sulphur Company (refining of sulphur).

Pacific Coast Borax Company (manufacture of borax and boric acid).

Gröndal briquetting plant at the works of the General Chemical Company. (This is the first American installation of the Gröndal process for briquetting ore, etc.)

Babcock & Wilcox Company (water-tube boilers and adjuncts).

Electro-Dynamic Company (interpole motors for wide speed variation).

Electric Launch Company (submarine vessels, etc.).

Industrial Oxygen Company (oxy-acetylene welding and cutting apparatus).

The excursion committee is confident that permission for visiting one or more other important plants will still be obtained. This will be announced later.

It is to be clearly understood that while the above-named companies have given permission to the society as a whole to visit their works, members interested in a competitive process are expected not to visit that particular plant. Thus the Standard Oil Company has given permission under the condition that no one connected with the refining of oil will be allowed to visit its works. Similar conditions have been made by the Babcock & Wilcox Company and the National Sulphur Company. The different plants to be visited, however, are of such a diversified character that every member will find enough of interest to take part in the excursion. The party will return to New York by special train.

In the evening of Friday a banquet will be held at the Hotel Cumberland. On the evening of Saturday, the society will be the guest of the New York Chemists' Club at a smoker in its clubhouse.

Very elaborate arrangements are being made for the entertainment of visiting ladies. These, as well as the titles of the papers to be presented, will be announced later.

Dr. Leo H. Baekeland is president of the society and Dr. J. W. Richards, Lehigh University, South Bethlehem, Pa., is the secretary. In order to make detail arrangements for the special train and luncheon on Friday, it is of greatest importance that anyone who wants to participate in the excursion should send early notice to Dr. Richards.

Changes in Patent Classification.

The Department of the Interior, United States Patent Office, Washington, D. C., makes the following announcement under date of October 5, 1909:

The following changes in the classification of inventions are hereby directed, to take effect immediately:

In Division XXXIV, class 104, Railways, abolish subclass—

76. Detector bars.

The patents contained therein having been transferred to a subclass hereinafter established in class 246, Railway Signaling.

In same Division, class 188, Railway Brakes, abolish subclasses—

78. Trip controlled—

79. Frangible devices.

80. Track circuit controlled.

The patents contained therein having been transferred to subclasses of the same title hereinafter established in class 246, Railway Signaling.

In Division XLII, class 246, Railway Signaling, establish subclasses—

Interlocking—

57. Detector bars.

58. Track circuit controlled.

59. Trip controlled—

60. Frangible devices.

The patents forming these subclasses are taken from the above abolished subclasses in classes 104, Railways, and 188, Railway Brakes, respectively.

The above appeared in the *Official Gazette* of the Patent Office.

Pittsburg Section, American Institute of Electrical Engineers.

The Pittsburg Section of the American Institute of Electrical Engineers met on the evening of October 12 in the lecture room of the Carnegie Institute to hear and discuss a paper by C. B. Auel, manager of the railway and control department of the Westinghouse Electric and Manufacturing Company, on "Arc and Incandescent Welding." This subject is one of very considerable interest to the steel and other metallurgical industries of Pittsburg, and was ably handled by Mr. Auel.

F. Theodore Nagel, of the Crucible Steel Company, Geo. H. Wood, of the Homestead Steel Works, Frank G. Galbraith, of the Mesta Machine Company, C. F. Scott, of the Westinghouse Electric and Manufacturing Company, and Julian Kennedy took part in the discussion which followed the reading of the paper.

Venezuelan Telephone Service.

Consul Isaac A. Manning, of La Guaira, forwards a directory of the Venezuela Telephone and Electric Appliances Company, an English concern with $500,000 invested, and reaching numerous towns, with Caracas as a center. The manager states that the company will soon begin the installation of metallic circuits on all lines.

The company holds no time concession from the Government, therefore no monopoly of the telephone rights, but it grants the Venezuelan Government a free service, governmental and municipal, and in return is immune from direct taxation and has the privilege of importation at fifty per cent discount from regular duties.

Second Annual Railroad Convention.

The Indiana Railroad Commission has sent out notices for the second annual convention of division superintendents, general managers and operating and dispatching employes of the railroads in the state for November 10 at the State Capitol building. The purpose of the meeting is the consideration of the railroad accidents that have been reported to the commission during the past year and to consider the proper steps to prevent such accidents. The commission announces that the number of accidents on railroads has been gradually decreased since the commission was given statutory authority to take precautionary action to reduce the number of railroad accidents. S.

QUESTIONS and ANSWERS

SMALL REFRIGERATING MACHINES.—(1) What is the average cost of a quarter-ton ice machine for family use? (2) What is the horsepower of the motor used for driving such a machine? (3) About what does it cost to manufacture 500 pounds of ice with a machine of this type, not figuring the cost of the current?—T. F. B., Presho, S. D.

(1) The average cost of a quarter-ton household ice-making and refrigerating machine is about $500 to $550. (2) The motor required should have a capacity of three-fourths to two horsepower, depending upon the type of machine used and the place where it is to be installed. For instance, in the southern states, where condensing water is apt to be very warm a larger size motor would be necessary. (3) This particular question is difficult to answer because the items of cost other than electric power are comparatively small. It is necessary to recharge the machine with ammonia possibly about once every twelve or eighteen months. Such a charge will cost in the neighborhood of $30. There is required eleven to fifteen gallons of water for condensing purposes for each hour the machine is in operation. A small amount of oil is also necessary. It has been calculated that the average cost of operation, including that for current furnished at three cents a kilowatt-hour, is a little over $3 per month.

CONSTRUCTION OF AN IGNITION BATTERY.—Kindly give me the proper formulas for constructing a sixty-ampere-hour, six-volt storage battery.—J. V. B., Chicago.

The construction of this battery, which is evidently intended for ignition purposes, is not such a small proposition as the inquirer evidently imagines. Unless he desires to build it merely for the experience of so doing, it will probably cost him considerably more than if he bought it ready made. A large number of storage batteries for this purpose are now on the market and have been so perfected as to give very excellent service. The first thing needed for making a storage battery is the building of the plates. It is customary to use lead grids pasted with a mixture of litharge and red oxide of lead. It will be necessary to have at least seven plates, four negatives and three positives for each cell. These may be, for the sake of simplicity, of the same construction, which provides a series of pockets for the retention of the paste or so-called active material. In one of the best known types of this kind of battery there are provided seven plates about four-and-three-quarter inches square and three-sixteenths inch thick; in an experimental battery it would be better to make plates at least one-fourth inch thick. The plates must be provided with a suitable lug, as an electrode terminal, for attachment to the connecting strap of each set. The paste referred to above is made by mixing the oxide with a small amount of dilute sulphuric acid to a stiff consistency and is applied to the plates in such a manner as to fill the pockets completely. After this the plates are allowed to dry. They must then be formed. This had better be done by connecting those plates which are to be positives, as positive electrodes in individual cells, on either side of which plate is a plain or dummy plate used together as negative electrodes. Those plates which are to be made into negatives must be connected in an opposite manner, that is, with a dummy positive plate on either side. The entire set of forming cells should be placed in series and connected with a source of low-voltage current capable of supplying up to two or three amperes. When the forming is to be begun, each cell is filled with sulphuric acid of about 1.150 specific gravity, and a low forming current sent through the set. After some sixty hours, more or less, the forming may be found completed, but it should be continued until the positives have assumed the characteristic dark brown color of lead peroxide, and the negatives the gray color of sponge lead. The plates must then be assembled with a separator between each pair. Perforated and corrugated rubber may be used for this purpose, or ribbed cherry wood of a thickness not in excess of one-eighth inch. A lead connecting strap must be lead-burned to the lugs on each set of plates in such a manner that the positives alternate with the negatives and there is room left for the separator between each two adjoining plates. Since the voltage of the battery desired is six volts, three such cells should be made up. The plates, when completed and assembled, should be placed in their respective hard rubber jars, and the positive strap of the first should be connected with the negative of the second, and the positive of the second with the negative of the third cell. These connections must be by means of lead strips lead-burned to the terminal straps. The electrolyte to be used in the battery should have a specific gravity, when the battery is fully charged, of not over 1.3, or as it is commonly designated, 1300. The battery, when provided with terminals and filled with electrolyte, is ready for charge and use. It is well to mount all three cells in a wooden containing box so as to keep the set intact without disturbing the connections between the cells. All these directions are given only in bare outline, and the details of the procedure are beyond the limits of a short article.

USE OF CORED CARBONS WITH ALTERNATING-CURRENT ARC LAMPS.—Why is it necessary to use a cored carbon for one of the electrodes in an alternating arc lamp?—M. D. C., Houston, Tex.

With every alternation of the alternating current the current has a zero value. At this moment the tips of the carbons tend to cool off and to break the arc. This cooling would be quite rapid on account of the high temperature of the carbon points attained at the peak of the wave. As the current re-established itself in the opposite direction carbon must be again volatilized to establish the arc. If the carbon tips have cooled off appreciably, however, this volatilization is not sufficient to establish a stable arc. In order to prolong the existence of the volatile arc beyond the zero value of the current, it has been found that use of a cored carbon is quite effective. The material in the core volatilizes quite readily and maintains its volatile condition easier than the pure carbon of the solid electrode. Therefore the arc, when a cored carbon is used, is maintained quite steadily and does not flicker as it would if solid carbons alone were used.

Annual Report of Allis-Chalmers Company.

The eighth annual report of the Allis-Chalmers Company for the fiscal year ended June 30, 1909, has been issued from the general offices at Milwaukee, Wis., under date of October 7. The following are extracts from the annual statement of President W. H. Whiteside to the stockholders:

The total earnings for the year ended June 30, 1909, after deducting cost of manufacturing and selling, taxes, insurance and other general expenses, dividends on preferred stock outstanding of the Bullock Electric Manufacturing Company and provision for doubtful accounts, were $1,809,009.37.

Less:		
Expenditures for maintenance, repairs and renewals on buildings, machinery, plant, tools, etc.	$668,218.17	
Reserves for depreciation on buildings, machinery, plants, tools, etc.	284,776.83	
Interest on bonds and notes payable	720,582.62	
		$1,673,577.62
Net earnings for the year		$ 135,431.75

During the past year your company suffered, with other industrial corporations, from a business depression, which, existing with fluctuating severity for three-quarters of the preceding year, continued, with little change, throughout the first half of the fiscal year ended June 30, 1909. This condition was reflected in the volume of your company's sales, which compelled your works to be operated during the year at about fifty per cent of their normal capacity, and, although improved methods decreased the cost of production, yet the fixed charges (interest, taxes, insurance, depreciation, etc.) necessarily continued nearly constant, and prevented your company from showing for the year larger net earnings.

New business booked commenced to show substantial gains in January last, and for the last half of the year averaged per month nearly sixty-five per cent more than the monthly average for the first half. This increase with advancing prices has continued to the present time.

Liberal sums have been appropriated out of earnings for maintenance and betterments of the several works of your company, with careful provision against fire risks. All expenditures for the development and patent protection of the newer lines of machinery, which formerly were carried forward as deferred charges, have been deducted this year from earnings.

An unusually large number of important patents covering inventions of our engineers were granted to the company during the year.

The uniform success met with in the sale and operation of our gas engines, steam turbines, hydraulic turbines and electrical apparatus, noted in the seventh annual report, continues, and the expectations therein expressed are being realized. With an efficient and harmonious organization, and the restoration of normal business conditions now evidenced throughout the country, there is reason to expect an increasingly heavy volume of orders of a steady and profitable character.

In a supplementary report President Whiteside says:

For the three months of the current fiscal year our expectations expressed in our annual report of an "increasingly heavy volume of orders" have been realized to the extent of a regular increase in amount for each month. In September the total amount of business booked exceeded every month but one since the organization of the company, and for the present month there is an equally favorable prospect.

Noteworthy in the reports of the treasurer and comptroller is the gain of over $1,000,000 in working capital, which now stands at $8,715,640.55. In the last quarter of the fiscal year there were sold $828,000 par value of first mortgage bonds, to reimburse the treasury on account of capital expenditures at the West Allis and other works.

The consolidated balance sheet of the company as of June 30, 1909, is as follows:

ASSETS.

Capital assets—		
Real estate, buildings, plant, machinery, patterns, drawings, good-will, etc., as at June 30, 1908		$37,496,887.30
Additions thereto during the year ending June 30, 1909, consisting of West Allis extensions and additions to other works		51,165.36
		$37,548,052.66
Investments (at cost)		260,000.00
Development and patents account—		
For the development and purchase of rights for the manufacture of new lines of apparatus, including steam and hydraulic turbines, gas engines and other machinery		1,318,091.93
Discount and commission on bonds.		2,683,189.25
Current assets—		
Notes and accounts receivable (less reserves)	$4,721,052.32	
Inventories of work in process, manufactured stock, general stores and supplies, at cost or market, whichever the lower	5,530,446.61	
Cash	2,299,017.40	
		12,600,516.33
		$54,409,850.17

LIABILITIES.

Capital liabilities—		
Allis-Chalmers Company:		
Preferred stock (Dividends at the rate of 7 per cent per annum accumulated from Feb. 1, 1904.)	$16,150,000.00	
Common stock	19,820,000.00	
		$35,970,000.00
The Bullock Electric Mfg. Company:		
Preferred stock (Dividend at 6 per cent per annum guaranteed by Allis-Chalmers Company.)	$ 1,170,000.00	
Common stock (The $1,499,300 remainder of the total authorized issue of $1,500,000 is owned by Allis-Chalmers Company and deposited with the American Trust and Savings Bank, Chicago, trustee, under the mortgage securing the bonds of the Allis-Chalmers Company.)	700.00	
		$ 1,170,700.00
First-mortgage 5 per cent gold bonds issued	$13,010,000.00	
Less:		
In treasury	$1,726,000.00	
Redeemed and canceled	136,000.00	
	1,862,000.00	
		11,148,000.00
Current liabilities:		
Loans and notes payable	$ 2,400,000.00	
Accounts payable	1,206,500.78	
Accrued bond interest	278,375.00	
		3,884,875.78
Reserve:		
For depreciation		1,714,845.35
Surplus, balance June 30, 1909		521,429.04
		$54,409,850.17

The consolidated profit and loss account for the year ended June 30, 1909, is given below:

Balance, June 30, 1908, as per last annual report		$385,997.29
Profit on operations of the fiscal year after deducting expenses of manufacturing and selling, dividends on preferred stock of the Bullock Electric Manufacturing Company, and provision for doubtful accounts	$1,809,009.37	
Deduct:		
Charges for maintenance, repairs and renewals on buildings, machinery, plant, tools, etc.	668,218.17	
Depreciation on buildings, machinery, plant, tools, etc.	284,776.83	
Interest on bonds, loans and notes payable	720,582.62	
	1,673,577.62	
Net profit for the year		135,431.75
Surplus, June 30, 1909, as per balance sheet		$521,429.04

Long Island Railroad's Extension Nearly Finished.

Work on the Long Island Railroad tunnels has advanced rapidly in the last month, and the progress made seems to indicate that trains will be running between Jamaica and the New York terminal of the company at Seventh Avenue and Thirty-first Street about the first of the year. The tunnels themselves are practically completed, and workmen are now laying the rails and ballasting. Considerable work remains to be done between Jamaica and Long Island City, but along part of the way the third rail is now being placed in position.

At the start of the service it will not be possible to maintain a full schedule, for two reasons. Lack of cars is one of them, and the other is that the New York terminal is not far enough advanced to permit it. There will be no difficulty in handling the service to be maintained at the start at the New York terminal.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

Stone & Webster, of Boston, report as follows the earnings of companies managed by them, for the month of August and the twelve months ended August 31:

GALVESTON-HOUSTON ELECTRIC COMPANY.

August:	1909.	1908.
Gross earnings	$ 111,294	$ 101,707
Net earnings	48,318	46,607
Surplus after charges	26,639	26,080
Twelve months:		
Gross earnings	1,181,350	1,065,863
Net earnings	499,074	439,163
Surplus after charges	244,578	198,549

BLACKSTONE VALLEY GAS AND ELECTRIC.

August:	1909.	1908.
Gross earnings	$ 74,404	$ 68,340
Net earnings	34,334	33,373
Surplus after charges	10,232	.....
Twelve months:		
Gross earnings	925,240	872,382
Net earnings	441,006	396,543

JACKSONVILLE ELECTRIC COMPANY.

August:	1909.	1908.
Gross earnings	$ 38,782	$ 36,271
Net earnings	17,489	17,129
Surplus after charges	7,970	7,897
Twelve months:		
Gross earnings	460,586	413,225
Net earnings	198,230	162,083
Surplus after charges	86,861	55,278

EL PASO ELECTRIC COMPANY.

August:	1909.	1908.
Gross earnings	$ 46,446	$ 41,398
Net earnings	17,901	10,509
Surplus after charges	9,642	3,433
Twelve months:		
Gross earnings	567,905	531,943
Net earnings	198,364	159,079
Surplus after charges	105,038	77,440

HOUGHTON COUNTY TRACTION.

August:	1909.	1908.
Gross earnings	$ 32,925	$ 25,951
Net earnings	17,337	13,179
Surplus after charges	11,121	8,577
Twelve months:		
Gross earnings	305,705	257,651
Net earnings	139,930	109,006
Surplus after charges	70,374	52,129

NORTHERN TEXAS ELECTRIC.

August:	1909.	1908.
Gross earnings	$ 109,421	$ 92,503
Net earnings	51,528	38,972
Surplus after charges	34,339	21,538
Twelve months:		
Gross earnings	1,203,508	1,058,200
Net earnings	535,906	441,191
Surplus after charges	337,910	258,069

PUGET SOUND ELECTRIC RAILWAY.

August:	1909.	1908.
Gross earnings	$ 194,383	$ 158,594
Net earnings	80,515	62,749
Surplus over charges	31,716	19,821
Twelve months:		
Gross earnings	1,785,614	1,625,058
Net earnings	594,833	606,065
Surplus over charges	46,742	98,318

MINNEAPOLIS GENERAL ELECTRIC.

August:	1909.	1908.
Gross earnings	$ 77,508	$ 74,411
Net earnings	40,612	39,997
Surplus after charges	10,584	7,906
Twelve months:		
Gross earnings	1,075,046	968,202
Net earnings	615,834	533,030
Surplus after charges	244,710	173,170

DALLAS ELECTRIC CORPORATION.

August:	1909.	1908.
Gross earnings	$ 128,749	$ 94,738
Net earnings	40,531	31,185
Surplus after charges	11,883	2,356
Twelve months:		
Gross earnings	1,281,685	1,144,891
Net earnings	473,900	374,830
Surplus after charges	132,189	20,986

TAMPA ELECTRIC RAILWAY.

August:	1909.	1908.
Gross earnings	$ 48,468	$ 45,474
Net earnings	19,664	15,751
Surplus over charges	15,070	10,612
Twelve months:		
Gross earnings	579,095	542,906
Net earnings	227,156	171,844
Surplus over charges	171,294	147,213

SEATTLE ELECTRIC COMPANY.

August:	1909.	1908.
Gross earnings	$ 610,815	$ 382,741
Net earnings	298,696	163,082
Surplus over charges	190,109	68,248
Twelve months:		
Gross earnings	5,409,932	4,398,997
Net earnings	2,267,003	1,792,275
Surplus over charges	1,059,804	748,398

FORT WAYNE & WABASH VALLEY.

The report of the Fort Wayne & Wabash Valley Traction Company for the month of August and two months ended August 31 compares as follows:

	1909.	1908.
August gross	$133,412	$125,586
Expenses	74,254	66,400
August net	$ 59,157	$ 59,186
Two months gross	905,613	856,257
Expenses	537,474	492,495
Two months net	$368,138	$363,762

NEW YORK TELEPHONE BONDS.

Allotment letters to the subscribers to the $12,500,000 four-and-one-half per cent thirty-year New York Telephone Company bonds have been mailed by Kidder, Peabody & Company. On the average, subscribers will get about ten per cent of the amount asked for.

Baring Bros. & Company, Ltd., who offered £2,500,000 of the same bonds abroad, have also made allotments, and subscribers to the sterling bonds will get about ten per cent of the amount for which they put in subscription.

SUSQUEHANNA RAILWAY, LIGHT AND POWER.

The Susquehanna Railway, Light and Power Company's report for the year ended June 30, 1909, compares as follows:

	1909.	1908.
Receipts, subsidiary companies, interest on bonds, own., etc.	$612,362	$551,479
Interest on bonds and dividends on stock subsidiary companies	247,656	244,980
Balance available for divs.	$364,706	$306,499
Dividends, preferred stock	204,610	131,632
Undivided surplus	$160,096	$174,867

ALBANY & HUDSON.

The report of the Albany & Hudson Railroad Company for the quarter ended June 30, 1909, compares as follows:

	1909.	1908.
Total operating revenues	$ 61,401	$ 56,281
Total operating expenses	41,924	39,618
Net operating revenue	$ 19,477	$ 16,662
Net revenue from outside oper.	13,530	10,164
Total net revenue from oper.	$ 33,007	$ 26,827
Taxes accrued	5,573	7,097
Gross income	27,434	19,730
Total deductions from gross income	29,066	22,653
Net corporate deficit	$ 1,631	$ 2,922

FONDA, JOHNSTOWN & GLOVERSVILLE.

The report of the Fonda, Johnstown & Gloversville Railroad Company for the month of August and two months ended August 31 compares as follows:

	1909.	1908.
August gross	$ 85,754	$ 83,200
Expenses	31,953	34,376
August net	$ 53,801	$ 48,824
Two months gross	170,961	164,477
Expenses	63,549	68,688
Two months net	$107,412	$ 95,789

PORTLAND ELECTRIC.

The Portland (Me.) Electric Company reports earnings for August and twelve months ending August 31, 1909, compared as follows:

	1909.	1908.
August gross	$ 25,503	$ 22,539
Expenses	10,640	9,045
Net	$ 14,863	$ 13,494
Twelve months gross	339,740	304,950
Expenses	130,693	124,870
Twelve months net	$209,047	$180,080

GARY & INTERURBAN BONDS.

Cram, Mulliken & Company are offering $350,000 of Gary & Interurban Railway Company first mortgage, five per cent, twenty-year gold bonds at ninety-four-and-one-half.

These bonds mature in 1929 and are callable at 105 and interest. They are part of an authorized issue, under a closed mortgage, of $500,000, and are issued in coupon form of $500 denomination. The electric railway upon which they are a lien is incorporated with a capital stock of $1,000,000 and has a fifty-year franchise to operate on the principal business street of Gary, Ind., the new steel city. It extends north and south from the gates of the Steel Corporation's mills and east and west through the city for seven miles.

Earnings of the line for the six months ended with August were $19,827, of which operating expenses consumed $14,842 leaving net of $4,984. The company estimates earnings for April, 1910, when the line from Gary and the extension to Hammond shall have been completed, at $4,500 net, and the net for twelve months after completion at $54,000. Deducting $17,500 for interest on these bonds leaves a balance of $36,500.

The company's line on the main street of Gary is now in operation, while another line is nearing completion. The power plant is finished and supplying current for operation of forty modern cars. With six steam-railroad connections, the company anticipates a heavy tide of travel, and with the growth of Gary it expects to be called upon to construct additional lines.

MASSACHUSETTS LIGHTING.

The Massachusetts Lighting Company's earnings for August compares as follows:

	1909.	1908.
August gross sales	$54,556	$48,650

TWIN CITY RAPID TRANSIT.

The report of the Twin City Rapid Transit Company for the month of Au-

gust and eight months ended August 31 compares as follows:

	1909.	1908.
August gross	$ 641,062	$ 592,702
Expenses	262,479	281,707
August net	$ 378,582	$ 310,995
Preferred dividends, charges and taxes	140,250	128,667
August surplus	$ 238,332	$ 182,328
Eight months gross	4,531,222	4,181,925
Expenses	2,162,532	2,095,436
Eight months net	$2,368,690	$2,086,489
Charges, taxes and preferred dividends	1,108,259	1,006,455
Eight months surplus	$1,260,430	$1,080,033

COMMONWEALTH POWER COMPANY.

The Commonwealth Power Company, of Jackson, Mich., has issued its annual report for the year ended August 31, 1909, which compares as follows:

	1909.	1908.
Gross receipts	$583,090	$536,815
Expenses	283,735	259,420
Net earnings	$299,356	$277,395
Charges	145,323	139,745
Net income	$154,033	$137,649
Dividends (preferred)	76,200	75,570
Surplus	*$ 77,833	$ 62,079

*Equal to earning 5.2 per cent on $1,500,000 common stock.

Gross receipts of the company for a period of four years compares as follows:

Year ended August 31:			
1909	$583,090	1907	$414,248
1908	536,815	1906	323,838

WESTINGHOUSE AIR BRAKE.

The annual report of the Westinghouse Air Brake Company for the year ended July 31, 1909, makes the following showing:

	1909.	1908.
†Net sales	$5,286,021	$5,308,016
Expense	3,246,748	3,293,260
Net earnings	$2,039,273	$2,014,756
‡Charged off	118,715	43,960
Surplus for year	*$1,920,557	$1,970,796
Cash dividends	1,374,481	1,787,110
Surplus	$ 546,076	$ 183,686
Previous surplus	4,911,674	7,477,987
Total surplus	$5,457,750	$7,661,673
Stock dividend, 25 per cent	.....	2,750,000
Profit and loss surplus	$5,457,750	$4,911,673

*Equal to earnings 13.71 per cent on $14,000,000 capital stock. †Net sales, brakes, etc., total income. ‡Charged off for depreciation, patents, etc.

AMERICAN LIGHT AND TRACTION.

The report of the American Light and Traction Company for the month of September and nine months ended September 30 compares as follows:

	1909.	1908.
September gross	$ 288,631	$ 246,048
Expenses	7,785	4,000
September net	$ 280,846	$ 242,084
Nine months gross	2,306,122	1,851,805
Expenses	79,190	36,000
Nine months net	$2,226,932	$1,815,805

CHICAGO RAILWAYS.

The report of the Chicago Railways Company for August and seven months ended August 31, 1909, compares as follows:

	1909.	1908.
Passenger earnings	$1,062,159	$959,167
Miscellaneous	26,050	20,999
Total gross	$1,088,209	$980,166
Operating expenses, maintenance and taxes	650,632	650,128
Balance	$ 437,576	$330,038
Thirty per cent of gross	326,462	294,049
Interest on property, 5 per cent	193,385	144,251
Net earnings	$ 133,077	$149,798
City's share, 55 per cent	73,193	82,390
Company's share, 45 per cent	59,884	67,408

Seven months: Gross earnings, $7,122,698; expenses, $4,711,035; balance, $2,411,664; thirty per cent of gross, $2,136,809; five per cent interest on valuation of property, $1,239,158; net income, $897,651; company's share forty-five per cent $403,943, and city's share fifty-five per cent $493,708.

AMERICAN TELEPHONE AND TELEGRAPH.

The American Telephone and Telegraph Company has issued a statement of earnings covering the nine months ended September 30, which compares as follows:

	1909.	1908.
Dividends	$11,036,612	$10,034,016
Interest and other revenue	7,980,364	7,297,154
Telephone traffic (net)	3,184,839	2,711,607
Real estate	72,866	120,134
Other sources	1,050,728	566,415
Total	$23,325,410	$20,729,329
Expenses	1,829,969	1,571,755
Net earnings	$21,495,441	$19,157,573
Interest	5,428,761	5,714,637
Surplus	$16,066,679	$13,442,935
Dividends paid	11,963,758	9,289,624
Surplus	$ 4,102,921	$ 4,153,311

Associated Bell Operating Companies of the American Telephone and Telegraph Company, not including the long-distance lines of the American Telephone and Telegraph, report for eight months ended August 31 compared as follows:

	1909.	1908.
Gross	$88,372,114	$82,208,034
Operating maintenance and taxes	64,288,375	59,092,296
Net earnings	$24,083,739	$23,115,738
Interest	4,531,285	5,144,252
Surplus	$19,552,454	$17,971,486

In 1909 all maintenance and depreciation is charged against expenses monthly, instead of being partly provided for by an extraordinary charge in December, as heretofore. The 1908 figures include in expenses for each month one-twelfth of the extraordinary provision which was made in December, 1908.

ONTARIO POWER COMPANY.

The report of the Ontario Power Company, of Niagara Falls, for the month of September and three months ended September 30, 1909, follows:

	Sept., 1909.	July 1-Sept. 30, 1909.
Gross receipts	$54,500	$159,888
Expenses	14,641	44,164
Net earnings	$39,859	$115,723
Interest	27,167	81,305
Surplus	$12,691	$ 34,418

MEXICAN TELEPHONE AND TELEGRAPH.

The report of the Mexican Telephone and Telegraph Company for the month of August and six months ended August 31 compares as follows:

	1909.	1908.
August gross	$ 39,836	$ 31,180
Expenses	18,232	16,357
August net	$ 21,604	$ 14,823
Six months gross	226,878	185,163
Expenses	107,616	104,016
Six months net	$119,262	$ 81,147

UNITED RAILWAYS OF ST. LOUIS.

The United Railways of St. Louis, Mo., for the twelve months ended June 30, 1909, report as follows:

Gross earnings		$10,821,180
Operating expenses and taxes		6,262,593
Net earnings		$ 4,558,587
Deductions:		
Depreciation	$ 38,562	
Interest charges	2,807,820	
		$ 3,346,382
Net income		$ 1,212,205
Preferred dividend		849,160
Surplus for year		$ 363,045

MICHIGAN STATE TELEPHONE.

The Michigan State Telephone Company reports for the seven months ended July 31, 1909, as follows:

RECEIPTS.	
Exchange earnings	$1,663,234
Toll earnings	437,609
Miscellaneous revenue	61,271
DISBURSEMENTS.	
General expenses	$ 113,314
Operating expenses	577,883
Maintenance expenses	696,666
Rentals	103,507
Miscellaneous expenses	96,687
Bond interest	267,117
Common dividends	51,877
Preferred dividends	79,894
Total disbursements	$1,986,946
Undivided profits	175,168

EDISON ELECTRIC ILLUMINATING.

The Edison Electric Illuminating Company, of Boston, has issued its annual report for the year ended June 30, 1909, which compares as follows:

	1909.	1908.
Gross	$4,111,342	$4,229,239
Expenses and taxes	2,737,496	2,658,929
Net	$1,373,846	$1,570,310
Miscellaneous income	45,360	38,442
Total income	$1,419,205	$1,608,751
Interest, etc	86,845	54,989
Balance	$1,332,360	$1,553,762
Dividends	1,424,389	1,390,796
Deficit	$92,029	*$162,967

*Surplus.

Lamps and motors connected as of June 30 compare as follows:

	1909.	1908.
Incandescent lamps	1,040,613	938,670
Arc lamps	9,282	9,867
Motors, horsepower	44,065	39,422

CHICAGO CONSOLIDATED TRACTION.

The receivers of the Chicago Consolidated Traction Company report for June as follows: Gross earnings, $221,841; expenditures and taxes, $180,801; net earnings, $41,039; interest, dividends, betterments, etc., $63,508; deficit, $22,469.

INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

The A. A. Automatic Kitchens.

The A. A. Automatic Manufacturing Company, of New York, N. Y., is placing on the market a labor-saving machine for performing such operations as coffee-grinding, dough-mixing, food-chopping, egg-beating, ice-cream freezing, butter-churning, etc.

These machines, named "automatic kitchens," are being very favorably received and should offer to central stations a good field for increasing their sale of current.

For household use, the automatic kitchens are made in three styles, a view of each style being shown herewith. In Fig. 1 is shown a style adapted for use in small apartments, where space is limited. Style No. 2, shown in Fig. 2, has the advantage over No. 1 in that either one or two utensils may be operated at the same time, the machine being provided with two flexible arms, one running at a slow speed, the other at a fast speed. Fig. 3 is a view of style No. 3. Like No. 2, it is equipped to operate two utensils at a time and has an additional convenience of all of the utensils being at all times clamped to the table top, in their proper positions. When a change from the use of one or two utensils to one or two others is desired, it is simply necessary to revolve the table top until the utensils next to be used are brought to their proper positions opposite the flexible arms.

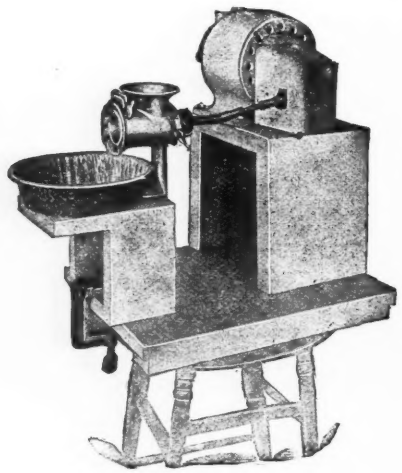


FIG. 1.

In addition to these three styles, the manufacturers are marketing a large machine for use in hotels and restaurants.

Weber Gas Engine Company Reorganized.

The Sheffield Gas Power Company, of Kansas City, announces that it has purchased the entire assets, factory and good will of the former Weber Gas Engine Company at the bankruptcy sale thereof. The factory has been in continuous operation throughout the term of the receivership, and has been continued in operation by this company without interruption, with the result that it is in position to furnish, without delay to any customer, the entire line of Weber gas engines and gas producers.

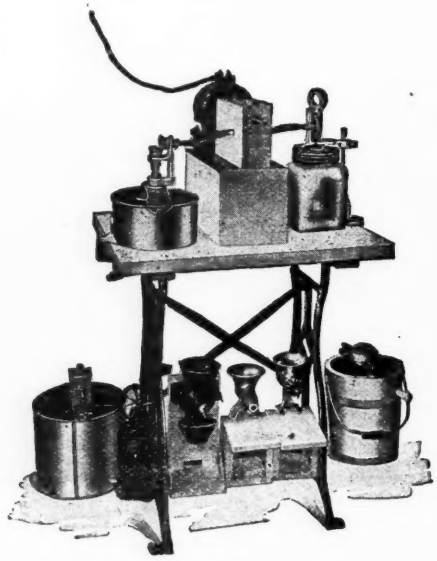


FIG. 2.

The management of the business, as well as the sales and factory departments, are in entirely new hands. George M. Hawes, the president of the company, is a graduate of the Massachusetts Institute of Technology and has been interested in machinery and electrical work for a number of years, giving particular attention to central-station power plants. He has also devoted much time to gas engine and producer design. Freeman Field, vice-president and treasurer, has devoted the past twelve years exclusively to the gas-engine business, both in the manufacturing and selling branches, and for the past seven years has been connected with the Olds Gas Power Company as general sales manager and western manager. W. H. Spiller, assistant manager of the company, studied at Harvard and Brown universities along the lines of electrical and mechanical engineering, and is thoroughly posted on power-plant installations, having installed both steam and gas power in many different industries. During the past six years he has been affiliated with gas power interests in both the selling and manufacturing lines, and is especially fitted to supervise the works and see that all the numerous details of construction in the high-grade gas power plants are carried out with care and precision. The engineering department has also been entirely rejuvenated and a new era of prosperity is now predicted for the company.

FIG. 3.

More Awards.

The Alaska-Yukon-Pacific Exposition has awarded grand prizes (highest award) for insulated wires and cables to the General Electric Company and John A. Roebling's Sons Company.

Pittsburg Exhibit of the Western Electric Company.

At the twenty-first exhibition of the Pittsburg Exhibition Society, held September 1 to 21, in Mechanics' Hall, Pittsburg, one of the booths which, due to considerable originality, attracted attention was that occupied by the Western Electric Company. The section blazed day and night with electricity supplied by a 220-volt, alternating-current motor and a 110-volt, direct-current generator. Fifteen hundred lamps of all sizes and descriptions from the Hawthorn flaming arc to the smallest Sunbeam lamps lighted the way to the section for the 750,000 visitors from all parts of Pennsylvania who attended the exhibition.

In the center of the exhibit was a unique cabin, the only part of which not Western Electric make was the bark roof. The sides were formed of Western Electric fir cross-arms, interspaced with glass insulators, and the door-posts of bark-covered, untrimmed rural telephone poles. Sunbeam lamps on Western Electric metal mountings, shone forth the initials "W. E. Co." on the front of the cabin.

PITTSBURG EXHIBIT OF THE WESTERN ELECTRIC COMPANY.

Another feature was the free telephone communication offered to any part of the city or to the building.

A standard Western Electric switchboard was installed in the section and connected up to the booths of the two hundred or more exhibitors. Trunks from the nearby telephone exchange were run to the board, thus affording private-branch connection for exhibitors and public telephone service for visitors.

The flashing signal lamps on the switchboard attracted an audience of their own, and the activity of the operator preached a sermon on courtesy that made a deep impression.

The annual exhibition of the business men of Pittsburg is one of the most popular features of the fall activities. Excursions are run daily to the city from all parts of Pennsylvania, and those residents of small towns who have business to transact visit the exhibition every afternoon and evening.

This year the Russian Royal Band opened the series of concerts, followed by the Prior Band, which preceded Walter Damrosch and his orchestra.

The rivalry in originality among the exhibitors is exceedingly keen. The palm this year, by general consent, is awarded R. M. Morris, sales manager of the Western Electric Company, for the decorations shown in the picture.

Unctuous Acheson Graphite.

Carefully prepared statistics show the mined production of crystalline graphite in the United States in 1908 was 3,433,033 pounds, valued at $149,763, while the same authority states that the output of electric furnace graphite in 1908 was 7,385,511 pounds, valued at $502,667. These figures are most interesting in that they define how man, aided by science, has developed a process that gives to the world more graphite every year than is mined in the United States. The graphite artificially made is an electric-furnace product, and unctuous, pure graphite, in the various forms in which it is available, has become a popular and efficient lubricant.

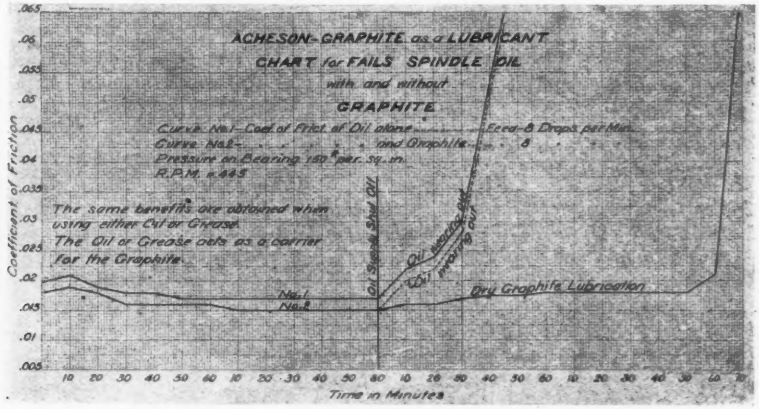

ACHESON-GRAPHITE as a LUBRICANT
CHART for FAILS SPINDLE OIL
with and without
GRAPHITE
Curve No1 Coef of Frict of Oil alone
Curve No2
Pressure on Bearing 150 lbs per sq in
R.P.M. = 445
Feed-6 Drops per Min
and Graphite
The same benefits are obtained when using either Oil or Grease
The Oil or Grease acts as a carrier for the Graphite
Coefficient of Friction
Time in Minutes
Dry Graphite Lubrication
No.1
No.2

CHART SHOWING RESULTS WITH AND WITHOUT GRAPHITE.

When considering the problem of lubrication, the fact should be borne in mind that the surfaces of the metals composing even the highest finished bearings, when examined with the magnifying glass, are found to be quite irregular, presenting microscopic cavities and projections. If the graphite be a natural one, in crystalline or compressed flake form, it is conceivable that these more or less hard and tough flakes may become impaled on the microscopic points. In fact the surprising claim is made that flake graphite performs its service of lubrication through the fact that it does become so impaled. If impaled, it is evident that the metal points must have penetrated or pierced the flake.

If the graphite used be unctuous, pure and soft, not crystalline nor hard, it will adjust itself with great ease to the microscopic irregularities of the surface, filling up the hollows and burying the points, thereby producing a mirror-like surface of great density, quite capable of withstanding continued wear and affording the highest form of lubrication. The filling up of the hollows and the burying of the points is the climax to be sought in graphite lubrication, and beyond question the longer unctuous, pure graphite is used, the better will be the results.

Brightness or blackness in graphite is no indication of quality or relative purity. Brightness in a graphite is evidence of ability to reflect light, and to do this requires a particle of some measurable size, and of a compact, homogeneous nature. Hard, tough, flaky graphite is far less valuable as a lubricant than unctuous, pure, soft graphite that possesses great spreading, covering and polishing power.

Both natural and electric-furnace graphite are reduced to powder form in pulverizers or similar apparatus, while deflocculated graphite is unctuous, pure, Acheson graphite reduced to practically a molecular condition, the finest state of subdivision, by a process invented by Dr. E. G. Acheson, president of the International Acheson Graphite Company, of Niagara Falls, N. Y. This deflocculated graphite is rendered so fine that it remains suspended in oil or water and may be passed through the finest filter paper made.

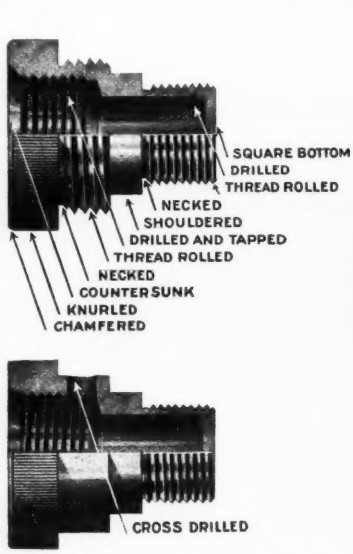
Remarkable Performance by a Motor-Driven Automatic Screw-Machine.

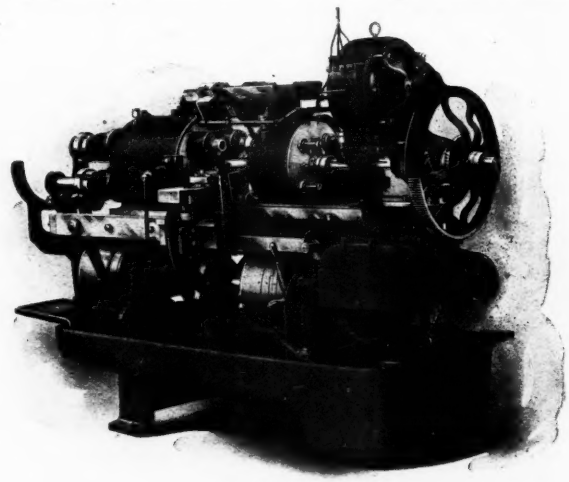
It would be an utter impossibility to convince an old-time machinist, say one who had departed this life a generation ago—were it possible for the nonce to bring him back to life—that the brass spud, shown in half-sectional elevation in the upper left-hand corner of the accompanying illustration, could be made by a machine tool in a single operation; but it is true nevertheless that this mechanical marvel is quite possible of accomplishment, and the "Acme" automatic multiple-spindle motor-driven screw-machine, made by the National-Acme Manufacturing Company, of Cleveland, Ohio, and illustrated herewith, is the machine by which the spud, or any of an infinite number of similar pieces ordinarily involving a series of more or less complex operations, can be and has been made.

The brass spud illustrated under the spud already referred to, shows cross-drilling which could be substituted for the rolled thread in the upper picture, and it is worthy of note that the whole of the operations necessary in turning out the upper spud on the machine were completed in the time required to drill the small hole only in the lower spud. The upper spud, made by the machine, was cut from the bar without being handled, all the tools necessary to make it having operated on it automatically and simultaneously. The inner thread was cut, the outer ones rolled. Incidentally it may be noted that a roll will frequently make a thread that is impossible to form by cutting. As regards cut threads, the Acme screw-machine will cut fine and coarse threads with equal ease and accuracy, and of course all intermediate sizes between the extremes within the range of the machine.

The Acme screw-machine illustrated herewith is only one of several types of similar machines made by the National-Acme Manufacturing Company, but it is believed that this motor-driven machine is one of the most typical of up-to-date practice in this line of work. A brief description of the illustrated machine follows:

The four spindles of the Acme automatic screw-machine carry four rods or bars of metal. Eight tool positions (four from the sides and four from the end) allow an exceptional number of operations. The stop for the stock feed does not occupy one of the tool positions. Tools are the same in number and similar in design to those generally used on screw-machines. Where the advantage in time or finish warrants, extra tools are used. Although the tool positions of the Acme provide for only eight operations, more are frequently possible by a combination of tools in one or more of the positions, or the use of special attachments. Accuracy of alinement is maintained by a positive locking of the spindle-carrying cylinder, compensation for wear being provided. All rotary movements on the machine are continually in one direction, consequently the strain of reversing due to the inertia of the revolving parts is completely eliminated, and all the spindles (both tool and stock) are directly driven by shaft and gears.





NATIONAL-ACME AUTOMATIC MOTOR-DRIVEN SCREW-MACHINE, AND SAMPLES OF BRASS SPUDS, THE UPPER ONE MADE BY THE SCREW-MACHINE IN A SINGLE OPERATION.

Feeding of the stock is accomplished by means of positive cam-controlled movements against a rigid gauge stop, which does not occupy one of the tool positions. The length of the cam throw and position of the stop are readily adjusted for length of feed. The threading operation is accomplished while the stock is stationary, the threading tool being rotated at the speed best suited to the size of the piece, the pitch of the thread, and the cutting qualities of the stock, the lead of the tools being governed entirely by the pitch of the thread. A positive start for the thread is provided by a lever movement.

Owing to the method of tooling employed, the threading is usually one of the shorter operations, and is allowed all the time necessary to perform whichever of the other operations consumes the most time. Due to this fact, a self-opening die is rarely used to advantage. Cam and lever movements are controlled by a series of gears, combinations being provided to cover the entire range of work possible on the machine. All the tools are flooded with oil when in operation, insuring thorough lubrication.

The absence of multiple belts simplifies the application of power to the machine, and makes the relation between the revolutions of the stock and the lead of the tools constant and positive, making possible accurate timing of changes from so-called idle movements (withdrawal of tools, indexing cylinder, etc.) to the cutting movements. The maximum use of the high speed is made possible, resulting in a larger production. The cost of maintenance and repairs is reduced; operation is simplified and made more convenient.

Several classes of work previously requiring rehandling, owing to the fact that they have not been satisfactorily and economically finished on automatic machines, can be completed on the Acme without in any way retarding the output. Special attachments, which in most cases are readily applied, are used for this purpose.

Independent motor drive may be applied to any of the Acmes. The substitution of a driving gear in place of the driving pulley and the addition of motor platform and support with motor and controller, being the extra equipment required. Either alternating-current or direct-current motors of any standard make may be used. Machines thus equipped

have all the facilities and conveniences of the best modern motor-driven tools, being entirely self-contained—taking the same floor space as without motor, and are symmetrically compact in appearance. They are conveniently independent of power transmission other than electric wires.

The Acme-National Manufacturing Company is at present distributing a letter calling attention to the remarkable performance mentioned above, and a concrete example of the spud itself, five-eighths of an inch long, is attached by a string to an eyelet secured at one end of the envelope.

A New Portable Testing Set.

A testing set of the dial decade type with several unique features for facilitating quick and accurate measurements is being put on the market under the name of the L. & N. Dial Decade Set. It combines lightness, compactness, and a full range of measurements, which include resistance measurement from .01 ohm to 10,000,000 ohms, and fault location by the Murray and Varley loop tests. This set is designed particularly for the class of measurements which are necessary in maintaining telephone and telegraph lines, and in clearing trouble in them. The manufacturers of this set, the Leeds & Northrop Company, have had extensive experience in producing this class of apparatus, and assert that the new model has many features which are decided improvements. The preliminary models were submitted to several eminent telephone and telegraph engineers for test, and valuable suggestions made by them were embodied. The improvements are such as bring about great convenience and simplicity of manipulation and calculation, and such robustness of construction as to insure permanent accuracy and reliability.

The general form of this set is improved by making the case shallow, only five inches deep, so that it will carry easily, in contrast to those that are almost square. The battery is fastened by two screws to the rubber plate and controlled by a knife switch. This makes it very easy to lift out the rubber plate intact, with battery, galvanometer, and coils all in plain view and easily accessible. The galvanometer is completely protected and made dustproof by a strong metal case, so that no dirt can enter when the set is opened.

The dial switches can be rotated continuously and no backward motion is necessary in going from the 9 point to the 0 point. The laminated brushes used in these switches are not bent square at the contacts, but at a slight angle, thus making a brush contact that, instead of wearing a groove in the studs, tends to simply clean the whole surface. The set is built on the four-coil decade plan. There is therefore no crowding of parts and the coils may be easily replaced by the operator if one should be burned out. The coils are constructed of manganin wire wound on brass spools, silk insulated and thoroughly baked in shellac.

The galvanometer in this set is of the suspension type, the old style pivot and jewel instrument having been entirely discarded on account of its susceptibility to jars, which blunt the pivots and make the pointer stick. The instrument will stand more rough use than an ordinary portable voltmeter on account of the spring suspensions; moreover, the galvanometer will deflect for the most minute current that can be put through it, there being no initial friction to overcome. Its sensibility is ample for all ordinary work.

LEEDS & NORTHRUP DIAL DECADE SET.

The arrangement of ratio coils is an original feature. These are controlled by a single rotary switch that makes contact on ratio studs as follows: 0, .01, 0.1, 1, 10, 100, and 1,000. The rheostat reading is then simply multiplied by the value indicated by the dial switch, and one is never in doubt as to whether to multiply by arm "A" or arm "B." This gives a range as large as can be accurately used with any set of this type. The contact resistance, which is so minute as to be negligible and will remain so, is in the battery circuit, so that even should it be high, it would not affect the galvanometer sensibility.

A marked feature in this set is the absence of all flexible cords. All connections for the loop tests, for outside battery and for outside galvanometer are made simply by throwing knife switches located on the rubber plate of the instrument. These eliminate the battery cords found on some sets, which have to be connected after the lid is open and, while in use, project outside the set.

CURTIS TURBINE USED AS REGULATOR.

BY W. J. DAVIS, JR.

An interesting example of the effectiveness of a Curtis steam turbine when used as a regulator on a large power system is found in the new Oakland power house of the Pacific Gas and Electric Company, of San Francisco.

The installation consists of a 9,000-kilowatt vertical type Curtis turbo-generator manufactured by the General Electric Company, eight 750-horsepower McNaull water-tube boilers and a Worthington condenser outfit having a cooling surface of 20,000 square feet.

The 60,000-volt transmission system of the Pacific Gas and Electric Company entering Oakland is delivering more than 100,000 kilowatts during maximum demand. Of this amount, 20,000 kilowatts maximum are supplied to Oakland and immediate vicinity, the load factor being about sixty per cent.

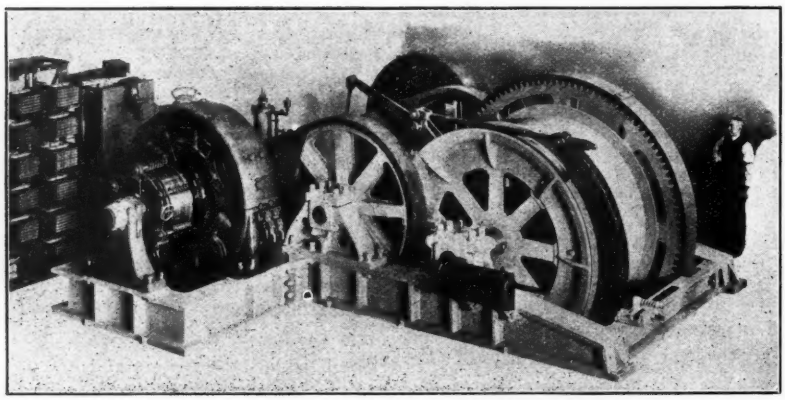
While the new plant is of great value in carrying the local peak load during hours of maximum demand, it is almost continuously kept connected to the transmission system on account of the steadying effect on the voltage and consequent improvement in the lighting service. When acting as a regulator, the duty is especially severe, the turbine taking sudden momentary swings in load from 500 to 9,000 kilowatts. In a word, the action of this turbine on an alternating-current system is equivalent to that of a large storage battery on a direct-current system.

The ability of the Curtis turbine to successfully take these sudden fluctuations in load is due to the large flywheel effect (about ten times that of a reciprocating engine of equal capacity), close speed regulation, large radial clearances between moving and stationary steam-using elements, and sturdy mechanical construction.

This use of a Curtis steam turbine is particularly interesting on account of the high economy obtained under varying load. Even when the turbine is operating as a regulator the over-all economy of the plant is exceptionally good.

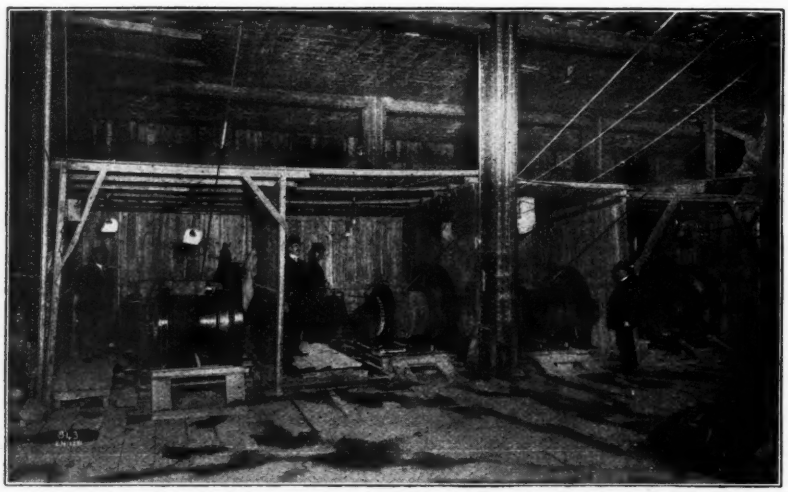
Lidgerwood Electric Hoist.

The coal shipping terminal at Sewells Point, near Norfolk, Va., is operated in a novel manner and contains some very interesting machinery, including a 1,000-horsepower electric hoist, designed and built for the purpose by the Lidgerwood Manufacturing Company, of New York.



LIDGERWOOD ELECTRIC HOIST FOR HANDLING PIER CARS.

The operation of getting coal from the cars that bring it to tidewater into the hoppers from which vessels are loading comprises two operations. In the first of these the cars are allowed to drift down by gravity, one by one, to where a barney car can pick them up and carry them up a short incline to a dumper. The dumper picks each car up bodily, tips it to an angle of sixty-five degrees, so that the coal is poured out into a special conveyor car of larger capacity, to be taken to the hoppers on the pier. As soon as each conveyor car is loaded it is taken in hand by the hoist, which, by means of a barney car, draws it up a twenty-five per cent incline at a speed of 480 feet per minute.



BATTERY OF LIDGERWOOD ELECTRIC BUILDING HOISTS.

The Lidgerwood hoist, shown herewith, complete with its two motors, weighs 180,000 pounds. It hauls the conveyor cars up the incline, using only one motor at a time, the other being provided to insure constant operation. The motors are of General Electric Company's make, and are rated at 550 horsepower. The drum of the hoist is eighty-four inches in diameter with a face of forty-two-and-one-half inches in width, grooved for a one-and-three-fourths-inch main cable and having also a section with a seven-inch face grooved for a three-fourths-inch tail rope, for insuring the return of the barney car. The drum has powerful post brakes which are controlled by solenoids through the medium of compressed air. The compressed air is supplied at a pressure of eighty pounds to the inch by an electric compressor which forms part of the hoist outfit.

The general operation of the hoist is controlled by an operator near the barney-car pit, 350 feet distant from the hoist. The hoist is also provided with an emergency limit switch which makes certain that it cannot overwind in either direction. The brake is set by a weight of 14,000 pounds acting upon a suitable lever. When the current is turned on the solenoid acts, and by means of the compressed air releases the brake. When the current is cut off, whether by intent or accident, the solenoid drops, releases the air, and the weight brings the brake into action, holding the load safely in any position.

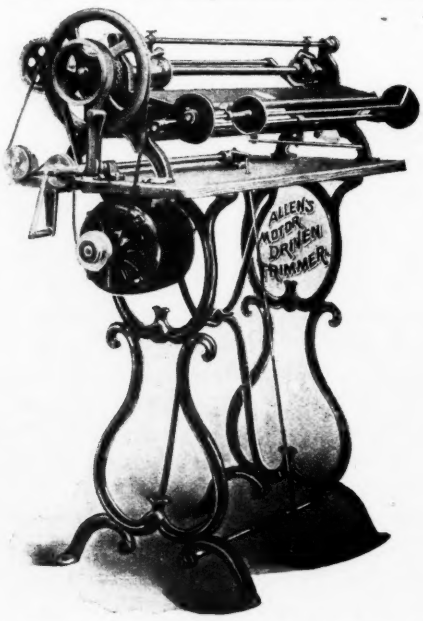
To meet the demand that has arisen for handling with rapidity and accuracy the vast amount of material required in the construction of tall buildings, the Lidgerwood Company is also manufacturing a line of high-speed builders' hoists.

In the accompanying illustration is shown a battery of these hoists in operation, erecting the Fifth Avenue Building in New York city.

A Motor-Driven Wall-Paper Trimmer.

The development of a means for further increasing the usefulness of wall-paper trimmers has recently been successfully completed by the addition of a small electric motor to drive a modified form of the hand wall-paper trimmer, manufactured by A. Allen & Company.

It is but an exemplification of the fact that small motors are being utilized to drive all manner of machines, formerly driven by hand or foot power, and in many instances are responsible for the developments of entirely new machines not possible without the motor. The outfit is sold by A. Allen & Company, 2001-5 Carpenter Street, Philadelphia, Pa.



MOTOR-DRIVEN WALL-PAPER TRIMMER.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, OCTOBER 8.—The apparently small sum for which the Marconi wireless stations are being purchased by the British government, viz., $88,000, has given rise to some speculation as to why the Marconi company should have agreed to what would appear to be a one-sided bargain. Inquiries at the company's office, however, show that no such feeling exists there, inasmuch as, by the sale of their coast stations, the company have got rid of at least one very embarrassing agreement with Lloyd's shipping agency, under which they were compelled to do two things for two different people, which were diametrically opposed to each other. On the one hand, they were forced to supply all shipping news to Lloyd's, and, on the other, respect the wishes of the ship owners that certain classes of information was for the use of the companies only. Again, under a clause in the agreement, it appears that Lloyd's claimed that the Marconi company was bound to erect another wireless station for their own exclusive use at the North Foreland, quite close to one already existing and erected by the Marconi company. The disappearance of these difficulties alone, which have been the cause of much expensive litigation, the Marconi company seem to feel would justify them in transferring their stations to the government on the terms mentioned, but the question of the tenure of their license is also an important factor. I believe the present license has three years more to run, and it is common knowledge that the government was not prepared to renew it. At least that has been the impression given by the speeches of the postmaster-general in the House of Commons.

An interesting fact in connection with wireless telegraphy is that the original patent granted to Marconi, which protected the general principles of the Marconi system, expires on June 2 next year, but as this has long since ceased to have any practical value the company have not deemed it necessary to set aside any sum for depreciation. A very large number of other patents protecting every detail of the system have since been taken out. In fact, the company owns about 500 patents.

An instance of the methods which retard the extension of electric lighting, at any rate, for street purposes, has arisen at Finchley, a large suburb in the north of London. The Council some time ago decided to adopt electricity for street lighting and prepared a scheme, which, as usual, light for light, was cheaper than gas. Considerable opposition was offered to the proposal by the gas company, who claimed to be able to do the work for less capital expenditure and less maintenance cost. As usual, however, the two schemes were not strictly comparable, and when the Local Government inquiry relative to the loan was held, the Council refused to submit an alternative estimate for doing the work by gas. The Board has now refused to grant the loan until such alternative estimate is provided, but the Council is taking a very firm stand on the principle that it is not the function of the Board to dictate the particular system to be used. Failing the receipt of the Board's sanction for a loan the necessary capital is being taken from the rates.

The application of electricity to mines bids fair to be the outstanding topic of the coming year. In Scotland a mine manager is to be prosecuted, criminally, for allowing his installation to get into a bad state of repair, whereby an explosion was caused, resulting in the death of two or three workmen. The case promises to be almost sensational, for electrical experts are to be called on both sides, and long arguments may be expected upon the interpretation of the mines regulations, under which the proceedings are being taken. All this is typical of the extreme interest which is now being taken in the subject, an interest which has been quickened by a suggestion that the coal owners of the northeast district of England should be petitioned to take out all electrical apparatus, owing to its danger to the men. The new institution of mining electrical engineers is taking the question up, and although only just inaugurated, a special committee has been appointed to investigate the use of electricity in mines from the employes' point of view. The Home Office Committee to consider an amendment of the existing rules relating to electricity in mines has not yet been appointed, and a good deal of curiosity is being displayed as to its composition, the general feeling being that it should not consist, as did the previous committee, of Home Office officials, with one independent engineer thrown in. The whole question of inspectorships will, most probably, have to come under review shortly. Some dissatisfaction is being expressed that the existing electrical inspector of mines has never been a practical mining engineer, and it is even alleged that he had never been down a mine prior to his appointment a short while ago. Further, to have one electrical inspector for the whole of Great Britain is regarded as absurdly inadequate, and it is felt that with sufficient supervision and inspection many of the accidents which have been happening lately would not have occurred.

It is quite refreshing to notice that even our great technical training institutions are beginning to lay stress upon the necessity of a business training for engineers. Dr. J. A. Fleming, in a discourse at the University College, London, this week drew attention to this, and a recommendation of this character, coming from so high a quarter, in relation to the training of electrical engineers, will doubtless have a great effect upon the arrangement of the curriculum in the future.

It is stated that the Post Office authorities are experimenting with an apparatus for typing telegrams, instead of having them written. This is an electrical apparatus, but the cost of its use is somewhat of a drawback at present.

The Engineering Standards Committee has issued a new specification dealing with ammeters and voltmeters. The object, of course, is to secure uniformity, in order to save trouble in tendering. Three degrees of accuracy are provided for, named sub-standard, first grade and second grade. The first must have an accuracy of within plus or minus 0.2 per cent for voltmeters and 0.5 per cent in the case of ammeters. The figures for second-grade instruments are 2 per cent and 4 per cent, respectively. An important part of the specification is the schedule of standard scale readings, which have been selected with a view to cheapening production by reduction of the number of patterns which have to be kept in stock, while at the same time keeping the buyers' wants in view. G.

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, OCTOBER 9.—There are to be two new electric-railroad lines installed in the region of the Fleimstal Valley, Austria, as it is desired to connect this extensive valley with the main railroad lines. In order to carry this out there were formed two independent syndicates, each of which had a separate project, but at present the two syndicates have consolidated, so that the work will be carried out in common. The first project called for an electric-railroad line starting from Cavalese, midway in the Fleimstal Valley, and proceeding as far as Neumarkt, which is a station on the South Austrian Railroad line. According to the second project, the line ends at Lavis, another point in the valley, lying fifteen miles south of the former. Seeing that the two syndicates are united, the line will have a greater length, as both projects are to be carried out. The electric line will be one-meter gauge and will have four per cent maximum gradients.

A new submarine telegraph cable has been laid between Borkum and Tenerife by the German-South American company. It was opened for international service on August 26.

The large canal which is already established in the region of Verona for irrigation purposes is now to be used as a source of power, and the Canale Milani company is taking measures to erect a hydraulic plant on the canal. The station is to contain five turbine groups, which work upon a ten-meter head of water. Coupled to the wheels are three-phase alternators, built at the Havre works of the Westinghouse Electric Company. The machines are of the 2,000-kilowatt type and deliver current at 3,000 volts. This is stepped up to 40,000 volts for transmission purposes. In connection with the turbine station there is erected a steam plant which contains a 2,000-kilowatt group, with a three-phase alternator and delivering 3,300 volts.

At Budapest steps are being taken to extend the subway known as the Franz Josef line, and it is to be lengthened at both ends. The project is to be carried out by the municipality in connection with the Budapest Electric Traction Company. The inner extension will be in subway, while the outer addition will use overhead construction, and will thence connect with the traction companies' lines. A. DE C.

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, ONT., OCTOBER 16.—According to a prominent Canadian broker, Belgians have nearly $50,000,000 invested in the so-called Pearson stocks—Sao Paulo, Rio, Mexican Power and Mexican Tramway stocks.

The Canadian Pacific Railway Company has now in operation a telephone wire from Cartier, Ont., to Brandon, Man., a distance of 1,045 miles. This is the nucleus of a system that will

stretch from the Atlantic to the Pacific with telephones along the company's branches.

The Mexican Power directors paid the regular 1 per cent quarterly dividend on the 15th inst. This is the second declaration since the Necaxa dam disaster, which was expected to put the company out of the dividend-paying business.

The first power from the Montreal river into the Cobalt silver camp is now being delivered by the Cobalt Power Company. The two larger competing companies, the Cobalt Hydraulic and the Mones Power Company, are hustling along their work very rapidly and expect to be in operation before the end of the year.

A deputation representing corporate interests has waited upon the Dominion government and asked that the power law of the Ontario government be vetoed, or the petitioners given authority to take it to the Supreme Court of Canada on the ground that it is ultra vires of the local Legislature. It was argued that, as the Niagara River is an international stream, the provincial government has no authority to vest power rights in the Niagara commission. It is also contended that the provincial legislation constituted an injustice to the electrical development companies which have invested millions of dollars in plants, and that the effect of the legislation was to injure Canada in the eyes of British financial people who desire to invest their money in the enterprises of this country. The ministers promised consideration of the matter.

The complications arising out of the power franchises on the Kaministiquia River have been adjusted by the Hydro-Electric Power Commission, which will supply cheap power to Port Arthur, Ont. The commission has contracted for 10,000 horsepower from the Kaministiquia Power Company. To secure this the storage dams at Dog Lake were arranged for some time ago. Fort William, however, is tied up to the power company for several years, and therefore cannot deal, at present, with the commission. The terms arranged for Port Arthur are: For the first 2,000 horsepower, $17 per horsepower, and between 2,000 and 4,000 horsepower, $16 per horsepower. Over 4,000 horsepower, $15 per horsepower. In addition, the city must pay its share of a small transmission line, the stepping-down station and the operating expenses, on a basis of 4 per cent interest. This will bring the cost to about $20 per horsepower. The city will take 5,000 horsepower to begin with, and the distributing plant is installed. W.

WESTERN CANADA.

(Special Correspondence.)

WINNIPEG, OCTOBER 16.—The C. P. R. R. has working a telephone wire between Brandon, Man., and Cartier, Ont., a distance of 1,044 miles. For the present this wire will be used for emergency purposes and not for the dispatching of trains. Every train running between these points will be fitted with apparatus enabling the conductors to make connection with the telephone wire at any point along the line. Officials of the company say the system has already proved most beneficial in several ways and is the nucleus of a telephone system which the company intends to build from the Atlantic to the Pacific. B. S. Jenkins, Winnipeg, Man., is general superintendent of the telegraph and telephone branches of the company.

At Weyburn, Sask., the Weyburn Rural Telephone Company has put in operation its line to the south of that town and has started work on several other lines radiating from Weyburn. Already a sufficient number of subscribers have been secured to make the venture a financial success.

The engineers in charge of the hydroelectric development for the city of Winnipeg at Point du Bois report that excellent progress is being made. It is anticipated the plant will be in operation by the beginning of 1912. Cecil B. Smith, C. E., Toronto, Ont., is the supervising engineer.

The Cobalt Power Company, of Cobalt, Ont., has awarded a contract to the General Electric Manufacturing Company of Sweden for the supply of sixty transformers and switchboards, in sizes of 160 kilovolt-amperes. Kilmer, Pullen & Burnham, of Toronto, Ont., are the Canadian agents of the Swedish firm.

The joint railway board at Port Arthur, Ont., has decided that four additional street cars are required for May delivery. Address J. J. Carrick.

The Alberta government telephone system has been connected wth a number of other telephone systems, and a conversation can now be carried on between Edmonton, the capital of Alberta, and Spokane, Wash. R.

LIGHTING AND POWER.

(Special Correspondence.)

MURRAY, IDAHO—An electric-light plant is proposed for this place.

HAZELTON, N. D.—George Zirbes is figuring on installing an electric-light plant.

DELMONT, S. D.—The city is considering the installation of an electric-light plant. C.

MINNEAPOLIS, MINN.—Henry W. Benton, Dr. Leo M. Crafts and Jos. S. Webster, an electrical engineer, have incorporated the Lake Minnetonka Public Service Company, with a capital of $150,000, to supply villages along the shore with electric light. C.

MARLIN, TEX.—The electric-light plant of I. J. Nathan has been destroyed by fire.

WATERTOWN, S. D.—Ferris Bros. have made application for an electric-light franchise.

MADISON, S. D.—The machinery will shortly be installed in the new electric-light plant. C.

TYLER, MINN.—Work has been commenced on the foundation for the electric-light station. C.

CARLISLE, ARK.—Allain & Crow have purchased the local electric-light plant from J. E. Tunis.

HAMLIN, TEX.—The Hamlin Electric Light and Power Company has been incorporated in this city.

McKINLEY, MINN.—Bonds for $5,000 for the construction of an electric-light plant have been voted. C.

HILLSBORO, MO.—This city will shortly vote on the issuance of $15,000 in electric-light bonds.

SNOHOMISH, WASH.—The Snohomish Electric Company is remodeling its plant, to double the voltage.

MANKATO, MINN.—It is proposed to take a vote on the establishment of a municipal lighting plant. C.

SUPERIOR, WIS.—The Great Northern Railroad will electrify the machinery at the Ohio coal dock No. 5. C.

COZAD, NEB.—Bonds for the erection of an electric-lighting plant and waterworks system have been voted. C.

BURDETTE, ARK.—The Three States Lumber Company will install an electric-lighting system for this town.

AURORA, MINN.—The Hartley Electric Company, of Virginia, Minn., has asked for an electric-light franchise here.

GRINNELL, IOWA—The Grinnell Electric and Heating Company will install 150 100-kilowatt tungsten lights. C.

PITKIN, COLO.—A. E. Reynolds, manager of the Gold Links tunnel, mines and mill, will install a hydroelectric plant. U.

SIOUX FALLS, IOWA—If a franchise is voted the Interstate Power Company will put up a $500,000 power plant here.

LOS ANGELES, CAL.—A $40,000 issue of electric-lighting bonds of the city of Glendale has been awarded to W. H. Holliday.

NEVADA, IOWA—The Nevada Electric Company has commenced work on the construction of a fireproof electric station. C.

ELK CITY, OKLA.—This city is to vote on the proposition to issue bonds for $35,000 with which to buy the electric-light plant.

DAYTON, WASH.—The survey for the power plant of the Walla Walla & Columbia Traction Company at Tukanon has been completed. U.

WOODBURN, ORE.—The Portland Railway, Light and Power Company will construct a transmission line from Mt. Angel to Woodburn.

WAYCROSS, GA.—There will be an election on October 15 on a proposed $45,000 bond issue to build a municipal electric-lighting plant. L.

IONE, WASH.—The Ione Water and Light Company has been granted a franchise by the county commissioners, to run for twenty-five years. U.

HAMILTON, MONT.—W. O. Fisk announced recently that a new generator will be purchased and installed in the electric-light plant as soon as possible.

POLSON, MONT.—Construction has been commenced by the Northern Idaho and Montana Power Company on an electric-light plant to cost $30,000. C.

ANDERSON, IND.—The American Steel and Wire Company will enlarge its mills in this city and equip the plant throughout with electric power and light. S.

WATERTOWN, S. D.—The Kirini-Gray electric-light plant has been sold to Ferris Bros. and the Council has granted a franchise to the new company. C.

MARSHALLTOWN, IOWA—H. W. Darling offers to either rehabilitate the Jones & Hovey electric-light plant or build a new one if granted a franchise. C.

WHITE BEAR, MINN.—H. M. Billseby & Company, of Chicago, have taken an option on the electric-light plant owned by the Fulton estate and George Reif. C.

INDIANAPOLIS, IND.—The Fish System Company has filed articles of incorporation, capitalized at $50,000. The company's declared purpose is to establish and equip a plant for the man-

ufacture and sale of electrical and power apparatus and supplies. George L. Fish, R. C. Davis, H. F. Huster and E. A. Leeson, directors. S.

YUBA CITY, CAL.—The Pacific Gas and Electric Company has recorded deeds to a right-of-way for an electric transmission line between this city and Sutter City.

ALBUQUERQUE, N. M.—The City Council has granted an electric-lighting franchise to M. P. Stamm, F. G. Pratt and D. A. Porterfield, who will build a plant at once.

SAN FRANCISCO, CAL.—The West Side Power Company has been incorporated here, with a capital stock of $25,000, by George Pollock, E. A. Clausen and G. S. Barkley.

LOS ANGELES, CAL.—The contract for lighting the new district of East Hollywood has been awarded to the Pacific Light and Power Company by the board of supervisors.

SEATTLE, WASH.—The Seattle Lighting Company will extend its mains in the district east of Green Lake station, also on the west side of the lake as far as Mountain View station. U.

NORTH YAKIMA, WASH.—The Yakima Valley Power Company has plans in the hands of an engineer for the new power house and office building, which the company is about to erect.

BEDFORD, IND.—The Bedford Power Company, which is building a power dam in White River to generate electricity, has been granted a franchise to supply Bedford electric light and power. S.

ST. PAUL, MINN.—The St. Paul Gas Light Company will enlarge the capacity of its electric-generating plant. A new gable roof and crane will be installed at a cost of $9,500 and machinery to cost $50,000. C.

MARYSVILLE, CAL.—A three-wire electric-power line is being strung from the Colgate power house of the Pacific Gas and Electric Company to the California Mother Lode Mining Company's property at Indiana Ranch.

HICKORY, N. C.—The Thornton Light and Power Company will begin using Southern Power Company current about November 1, and will expend $5,000 in making the change, disposing of the old steam plant and generators.

HELENA, MONT.—Until Monday at 12 o'clock, October 18, the city of Helena, Mont., will receive sealed proposals in accordance with specifications, for furnishing, f. o. b. Helena, Mont., the equipment for an electric-light plant.

FAIRVIEW, UTAH—A mass meeting of the citizens of Fairview was held recently with a view of purchasing the plant of the Fairview Electric Light Company. The arrangements will be completed some time in November. N.

ROCKINGHAM, N. C.—The Rockingham Power Company is ready to reinaugurate work on the Blewitt's Falls hydroelectric plant, the works now being in the hands of Mr. W. A. Leland, receiver. About 1,000 men will be required. L.

HIGH POINT, N. C.—The Town Council has closed a contract with the North Carolina Public Service Corporation for 100 arc lights for street-lighting, the corporation in turn securing current from the Southern Power Company. L.

NORTH YAKIMA, WASH.—President Strahorn, of the North Coast Railway, is reported to be behind a project launched for the purpose of purchasing Priest Rapids on the Columbia River, where it is possible to develop 100,000 horsepower.

TOLEDO, OHIO—H. S. Swift, auditor of the Toledo Railways and Light Company, was this week elected president of the accountants' association of the American Street and Interurban Railway Association, at the session held in Denver. H.

RICHMOND, IND.—The Pilot Motor Car Company has announced that it will equip a large factory in this city with the latest electric machinery for power and other purposes. C. H. and H. M. Keramer and George Seidel are the directors. S.

SAN FRANCISCO, CAL.—It is reported from Oregon City, Ore., that the Southern Pacific Company is to build a power station at Cazadero, Ore., with an initial capacity of 50,000 horsepower and a possibility of developing 150,000 horsepower.

TOLEDO, OHIO—The city of Ottawa, Ohio, will soon be completely lighted by electricity. The electric-light company is now at work installing arc lights on Main Street and placing seventy-nine 100-candlepower tungsten lights on various other streets. H.

TOLEDO, OHIO—Work will soon begin on the actual construction of the big power plant to be erected at Ballville, Ohio, near Fremont. J. H. Cameron, P. F. Magenheimer and J. S. Taylor, of Chicago, representing the financial interest backing the project, were in Fremont this week, closing up the preliminary details. H.

BAKERSFIELD, CAL.—J. F. Stratton, general manager of the West Side Electric Company, states that the foundations of the company's power house are now about completed and that the machinery, including Westinghouse 2,300-volt generators, is en route. The company will establish its headquarters at Maricopa, Cal.

THE NATIONAL METAL MOLDING COMPANY, Pittsburg, Pa., has recently distributed a post-card showing a view of the new Peoples Gas, Light and Coke Company's building, Chicago, Ill., in which "Sherarduct" conduit has been installed exclusively.

TULARE, CAL.—The Mount Whitney Power Company has bought the electric-lighting system of the Consolidated Heat, Light and Power Company in this place. Heretofore the latter company has been buying current from the Mount Whitney Power Company.

MINNEAPOLIS, MINN.—The Great Northern Development Company, of Duluth, Minn., has secured land on both sides of the Mississippi between Anoka and Coon Creek Junction for the erection of a million-dollar power plant, with a capacity of 15,000 hydroelectric horsepower. C.

CHILLICOTHE, MO.—This city has called a special election, to be held October 23, for the purpose of voting on the proposition of issuing $150,000 bonds for a new waterworks and electric-light plant. The Fuller-Coult Company, Chemical Building, St. Louis, Mo., are the engineers.

NEW ALBANY, IND.—The Robison & Norton Company announces that the large factory recently destroyed by fire will be rebuilt. The entire plant was operated by electricity and the new plant will likewise be thoroughly equipped and every machine operated with electricity. S.

JACKSON, CAL.—The General Electric Power Company, of California, has filed notice here of the appropriation of 20,000 inches of water from the Mokelumne River, together with claims to a power site of 800 acres and to a right-of-way for a ditch from the river to the power site.

DAWSON, ALASKA—Heathcote Thurston, manager of the Northern Light and Power Company, says that the company will next year spend $80,000 in erecting coal bunkers at Coal Creek Landing, where a concrete power house is to be erected. Work on the transmission system has been started.

EAST POINT, GA.—The opening of the new $85,000 electric-lighting and water plant in this town was the occasion of note. Mayors from nearby towns and officials from Atlanta were included on the programme, followed by an old-fashioned barbecue dinner. The plant is modern in every respect. L.

TOLEDO, OHIO—At the regular October meeting of the Toledo section of the American Institute of Electrical Engineers, held last night in Builders Exchange Hall, George E. Kirk delivered an interesting address on wave and current principles in electricity. The meeting was well attended. H.

REDDING, CAL.—The Sacramento Valley Power Company has begun construction work on the extension of its transmission line from Red Bluff to Chico. The company has applied for a lighting franchise in the latter town, and the desired franchise has been offered for sale on November 2.

LAFAYETTE, IND.—The Indiana Electric Transmission Company has notified the secretary of state that the company had changed its principal office from Lafayette to Terre Haute, Ind. The company is preparing a bond issue to secure finances to carry out a big undertaking. H. S. Hyatt is secretary. S.

GREENVILLE, S. C.—The Monoghan Cotton Mills is expending some $30,000 for electrical machinery to operate its extensive textile machinery. The power will be supplied by the Southern Power Company, Charlotte, N. C., the power being transmitted from the Great Falls plant of the company on the Catawba River. L.

PEORIA, ILL.—The Peoria Gas and Electric Company has about completed the underground work and is connecting the consumers to that source of supply themselves. This has been a large undertaking, as all services were formerly overhead and the new connections have been made entirely in conduit, with lead-covered wire. V.

LEROY, ILL.—The Leroy Electric Light, Power and Heating Company has taken down the old open series arc lights formerly used for street lighting and has replaced them with series tungstens, running eleven and twenty-two in series on the secondary of one hundred and ten volts and two hundred and eight volts, respectively. V.

NOBLESVILLE, IND.—It is reported that the hydraulic dam and electric generating plant just being completed, north of this city, has been sold by the Noblesville Hydraulic Company to the Indiana Union Traction Company, which will use the power to run its cars in addition to the sale and distribution of the current to cities and towns. S.

GRAHAM, N. C.—To develop a waterpower on Haw River, supplying power for the operation of a new cotton mill, the state has chartered the River Falls Cotton Mill Company, with $200,000 capital; J. W. Menefee, president and treasurer, and R. N. Cook,

secretary. The company will build an extensive cotton mill plant and develop its own hydroelectric power. L.

WINONA, MINN.—Owing to the determination of the Winona Railway and Light Company to withdraw direct-current service an independent plant may be installed. C.

FERGUS FALLS, MINN.—The Otter Tail Power Company offers to furnish the city with electricity on a ten-year contract at two-and-one-half cents per kilowatt, two-and-one-fourth cents for the second 200,000 kilowatts, delivered at the city switchboard, provided the city will not engage in the business of furnishing power for ten years. C.

OGDEN, UTAH—The board of directors of the Davis and Weber Counties Canal Company has decided on the erection of a 5,000 horsepower plant on the Ritter farm, five miles south of Ogden. The company's canal will be cemented for a distance of nine-and-one-half miles and its reservoir in East Canyon will be enlarged by raising the dam thirty feet.

MUNCIE, IND.—C. E. Ruger, receiver for the Muncie Light Company, has filed his first report with the federal court, which shows a net earning of $86.05 during the month of August. The receipts for the month were $3,263.42 and the expenditures $3,117.37. The master in chancery recommends that the plant be sold to satisfy the mortgage indebtedness. S.

SOUTH BARRE, PA.—Work has commenced on the new power house for the Barre Wool Combing Company and completion is expected within two months. It will contain the most up-to-date equipment for generating electricity by which the mill is operated, and it is to be worked in conjunction with the valuable water privileges already partly developed.

ELECTRIC RAILWAYS.

(Special Correspondence.)

MANITOWOC, WIS.—Surveyors are working on the survey for an interurban line through Mishicott to Green Bay, for the Northwestern Hydro Company. C.

STEVENS POINT, WIS.—Appletree Barnes, of Waupaca, states that construction and grading on the electric line to Portage will be commenced this fall. C.

PITTSBURG, PA.—The New Castle plant of the Standard Steel Car Company will be rebuilt on a much larger scale for the purpose of engaging exclusively in the building of all-steel street cars.

SANTA BARBARA, CAL.—The City Council has passed an ordinance granting to the Pacific Improvement Company a franchise for the construction and operation of certain electric lines in the city.

GREENSBURG, IND.—Mayor Thompson, George Littell, William Flemming and others are promoting a traction line from this city to Batesville. The purpose is to ultimately extend the line to Cincinnati, O. S.

COLUMBUS, IND.—The Indianapolis, Columbus & Southern Traction Company has decided to purchase and string a "fournought" trolley wire between this city and Indianapolis, a distance of forty-one miles. S.

HARRISBURG, PA.—A charter has been issued to the Bedford, Fulton & Franklin Electric Railway Company to build a fifty-mile line between Bedford and Chambersburg, Pa. The road has a capital of $300,000. M. J. Murphy, of Pittsburg, is president.

MERRILL, WIS.—The Merrill Street Railway has completed the laying of new track over the entire system here. Much of the roadbed was reconstructed. Several new cars are to be purchased and the old ones are being repaired and painted. The improvements will cost about $15,000. M.

MADISON, IND.—The City Councils and Town Boards of this city, Hanover and other towns have granted franchises to the Cincinnati, Madison & Western Traction Company to operate cars through the streets. Work will be begun on this line as soon as the survey, which is well along, is completed. S.

LEBANON, PA.—A franchise has been granted the Ephrata & Lebanon Street Railway Company by the Lebanon City Council's passing finally the ordinance giving the company permission to establish a terminus in the heart of the business section of the city. Lebanon and Lancaster capitalists will provide the money.

SEATTLE, WASH.—Control of the United Railways Company and the Ruth Trust Company, of Portland, Ore., has changed as a result of the deal between J. H. Hurlbert, a capitalist of Fontanelle, Ia., and C. T. Dunbar, a capitalist and heavy timber owner of Vancouver, B. C., on the one hand, and Moritz Thomsen and W. D. Hofius, of Seattle, and T. L. Greenough, of Missoula, on the other, Hulburt and Dunbar purchasing the five-ninths interest in both concerns held by the last three persons named. The purchase price was not made public, but it is known to lie between $2,500,000 and $5,000,000. The United Railways Company has an authorized capital of $3,000,000 and an authorized bond issue of $5,000,000. It at present operates a line of railway running west from Portland toward Forest Grove and Hillsboro, through which towns it is to be extended into a wonderfully rich section of the state.

HAGERSTOWN, MD.—At the annual meeting of the stockholders of the Washington County Railway Company the following directors were elected: J. Clarence Lane, Edward W. Mealey, John W. Stonebraker, of Hagerstown; Clinton E. Miller, of Weverton; Oscar G. Murray, W. H. Matthai, C. W. Woolford, of Baltimore.

HORNELLSVILLE, N. Y.—Papers have been filed with the secretary of state at Albany for the consolidation of the Hornellsville Electric Railway Company, the Hornellsville & Canisteo Railway Company and the Canisteo Valley Electric Railway Company into the Hornell Traction Company, capitalized at $120,000.

JANESVILLE, WIS.—The Chicago-Wisconsin Valley Railroad Company has been organized at Portage, Wis., to construct an electric road from here to Merrill, Wis., touching six county seats—Madison, Lodi, Briggsville, Friendship, Grand Rapids, Stevens Point, Wausau and Merrill. A. J. Behmeyer, Indianapolis, is secretary of the company. C.

COLLEGE STATION, TEX.—The people of Bryan are working up interest now in the proposed trolley line between Bryan and the A. and M. College of Texas. It is believed that such a line would pay well on the investment. The college is a community of itself, and except for the grocery store of W. C. Boyett & Son, all mercantile accommodations must be secured at Bryan.

DELPHI, IND.—E. W. Bowen, J. C. Smock and M. G. Haun, directors of the recently incorporated Delphi, Flora & Burlington Traction Company, have secured the services of Will R. White, of Monticello, to take active charge of the financing and construction of the road. The people are a unit for the road and the plan is to have cars running by the middle of the coming year. S.

FRANKFORT, IND.—Satisfactory progress is being made toward the construction of the Indianapolis, Frankfort & Logansport Traction Company's line between here and Michigantown. Material is being received for track laying and since the Clover Leaf Railroad has installed Streng gas-electric cars on its road between Frankfort and Marion it is rumored that this type of cars will be used by the interurban line now constructing. S.

DAYTON, O.—This city will soon have a fine new interurban terminal depot if plans now being considered by the various interurbans and the Chamber of Commerce do not miscarry. There are eight lines entering the city from different parts of the state, and nearly all have different terminal facilities. Representatives of the various roads, together with a committee from the Chamber of Commerce, have been considering the matter.

OTTAWA, ILL.—Another electric-railway proposition is arousing interest in this locality, and more particularly in Livingston County. The proposed new road is styled the "Corn Belt Line," and the route marked out, beginning at Chicago, will take in the following towns in the corn belt: Plainfield, Plattsville, Lisbon, Seneca, Ransom, Budd, Blackstone, Cornell, Streator, Flanagan, Gridley, El Paso, Kappa, Hudson, Herrick, Normal, Bloomington, Mackinaw and Peoria.

FOSTORIA, O.—Incorporation papers for the Fostoria and Fremont Railway Company have been issued at Columbus. The line will parallel the L. E. W. and will connect the Lake Shore Electric which will furnish the power and the Western Ohio, of which F. D. Carpenter is general manager, over the Fostoria, Findlay and Toledo. The proposition is fully financed, much of the right-of-way secured and Chief Engineer J. W. Riegel will begin within ten days and the grading will be done this fall. The offices will be in Fostoria.

NEW ALBANY, IND.—The Louisville, Blue River & French Lick Traction Company has filed articles of incorporation with the secretary of state. The capital stock of $10,000 will be increased in a short time. The company proposes to construct street and interurban railroads in and between New Albany and French Lick and the intervening towns of Mooresville, Galena, Greenville, Palmyra, Fredericksburg, Hardinsburg, Chambersburg, Paoli and West Baden. The directors are Jacob H. Fawcett, Chas. D. Kelso and Wallace A. Gadient. S.

ASHEVILLE, N. C.—At least $500,000 in bonds will be asked by the promoters of the Asheville and East Tennessee Railway (electric), $200,000 from Buncombe County, $100,000 from Asheville and $200,000 from Mitchell and Yancey counties, toward the completion of this projected electric highway from Weaverville to connect with the Carolina, Clinchfield & Ohio, to the east. The various counties and Asheville will hold elections if the proper petitions are presented to the authorities asking for them, and several have already promised to call such elections if necessary. The proposed line would handle both freight and passengers; in this same connection the Weaver Power Company

has begun work on a new power plant near Marshall, on the French Broad River, where the river is bounded on either side by high mountains, making such a plant feasible. This company has an agreement with the Asheville and East Tennessee Company to supply power at reasonable rates. This new line will run about forty miles, at the lowest estimate, to Galax, in Mitchell County, to connect with the C., C. & O. Railroad, giving Asheville a direct connection with the Virginia coal fields, and those of West Virginia. L.

MARSHFIELD, ORE.—The Coos Bay Electric Railway Company has just been incorporated with a capital stock of $1,500,000. The incorporators are James H. Flanagan, W. S. Chandler and F. C. McCollom. Those connected with the movement say their plans are not sufficiently developed to make any statement of the purpose of the company. Mr. Flanagan is a local banker and Mr. Chandler is a San Franciscan interested extensively in Coos Bay. He was formerly receiver for the railway in this county purchased by the Southern Pacific.

NEW YORK, N. Y.—The maps and profiles for the first trolley line from Flushing through Whitestone to the central north shore sections of the Borough of Queens have been approved by the city and working permits have been issued to the New York and North Shore Traction Company. Ground was broken last week at Broadway, Prince and State streets for the roadbed. At this point connections will be made with the lines of the New York & Queens County Railroad, which will transport north shore passengers over the Queensboro Bridge to Manhattan.

TERRE HAUTE, IND.—The trial and argument in the suit by the city to oust the Terre Haute, Indianapolis & Eastern Traction Company from the streets have been completed and a decision is expected in ten days. The company has no franchise to operate interurban passenger and freight cars in the streets of Terre Haute and the traction officials complain of the city authorities exercising a passive attitude until after it had expended $4,500,000 in interurban lines and terminals and then hold it up for a big price for a new franchise. The case has been stoutly contested. S.

IOWA FALLS, IOWA—The City Council is considering the proposed electric-light and street-railway franchises which the Interstate Power Company is asking for a period of twenty-five years, and, if found acceptable in the ordinances submitted by the company, to issue a call for a special election for the people to vote on the granting of the two franchises. It is stated the company proposes to invest a half million dollars or more in a big waterpower plant here, and that among the details are a thirty-foot dam across the Iowa river a short distance below the Oak Street bridge. It is estimated the plant will develop between 2,500 and 3,000 horsepower.

BOONTON, N. J.—Permission to construct, maintain and operate a trolley line through certain streets here has been obtained by the Morris County Traction Company. The trolley line which the Morris County Traction Company is to construct must be finished and cars running by July, 1910. The committee, consisting of members of the Common Council and the Business Men's Association, appointed last June in regard to securing the right-of-way for the trolley between Boonton and Denville, reported that it had secured the right-of-way for most of the distance, but there were two or three exceptions that the trolley company would have to deal with directly.

INDIANAPOLIS, IND.—Further proposals for the completion of the Indianapolis, New Castle and Toledo Traction, for nearly two years under receivership, between here and New Castle, have been submitted to Judge Vinson Carter, of the Superior Court, showing that D. M. Parry, William M. Stevenson, Indianapolis; Eugene Bundy and Charles S. Hernly, New Castle, the original promoters, have become conditional purchasers of the claims against the company. They have made partial payment and agree to settle the remainder in 1910. The amount required to complete the road is $390,000, which it is proposed to raise by the sale of receiver's certificates for $460,000 at eighty-five cents on the dollar, payable in three years, bearing six per cent interest. The Union Trust Company, of Indianapolis, receiver, has agreed to buy the entire issue and it is likely that the completion of the road will be authorized at once.

PEORIA, ILL.—It is expected that within the next thirty days the Illinois Traction Company will have track laid in St. Louis, Mo., from Broadway and Salisbury Streets to Twelfth Street and Lucas Avenue. The big bridge is expected to be finished by the middle of December and with that the company will inaugurate through trains from this part of the state to St. Louis, putting on a sleeper service both ways. The improvements in St. Louis will cost $5,000,000. There will be a passenger station at Broadway and Salisbury Street, a passenger station at Ninth, Eleventh, Branch and Palm streets, a passenger station and freight depot at Twelfth, Thirteenth, Gay and Linden streets. Among the plans to be carried out is the building of a large passenger station near Broadway and Washington Street and the securing of the Clark syndicate lines crossing the downtown loop to use the same station, which will bring all the interurban lines to a central point. V.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

NAPOLEONVILLE, LA.—This city is going to rebuild its electric-light plant.

CLINTON, LA.—This city has voted $15,000 in bonds for an electric-light plant.

OLTON, TEX.—The Olton Independent Telephone Company has been incorporated.

FESTUS, MO.—This city will vote on a bond issue of $15,000 for an electric-light plant.

NEW IBERIA, LA.—This city is about to begin the construction of an electric-light plant.

McKINLEY, MINN.—Bonds for $5,000 for the construction of an electric-light plant have been voted.

BILLINGS, MONT.—J. B. Arnold and others are planning the building of an electric line to Laurel.

WILLS POINT, TEX.—The Wills Point Telephone Company has been incorporated, with a capital stock of $16,500.

CHARLESTON, OKLA.—The Home Rural Telephone Company has been incorporated by F. Z. Winchell and others.

LUBBOCK, TEX.—The Lubbock Light, Power and Ice Company has been incorporated, with a capital stock of $25,000.

AUBURN, CAL.—The Pacific Telephone and Telegraph Company will spend $35,000 in improving its system at this point.

SEATTLE, WASH.—The Oregon and Washington Long-Distance Telephone Company has been incorporated, with a capital of $1,500,000.

GILBERT, MINN.—The Mesaba Telephone Company, of Duluth, will install an exchange in the Dowling printing building on Broadway. C.

BELLINGHAM, WASH.—The Home Telephone Company, of Puget Sound, will expend $10,000 to $15,000 for improvements and betterments in this city. C.

SANTA CRUZ, CAL.—The Pacific Telephone and Telegraph Company will erect a three-story telephone exchange building in this city, at a cost of $100,000.

BADGER, MINN.—The Independent Telephone Company, H. S. Halverson, secretary, organized by farmers in the Pine Creek settlement, will extend the line to this village in the spring. C.

IRWIN, IOWA—H. Harmon will erect a building, 22x32, as a telephone office for the Farmers' Mutual Telephone Company. C.

MICHIGAN, N. D.—Work will shortly be started by the Michigan City Telephone Company on the construction of its line. Connections will be made with the Tri-State at Petersburg and the Sheyenne line at Mapes. C.

BANGOR, ME.—The Warren Telephone Company has been organized at Warren, for the purpose of conducting, operating and maintaining telephone lines. Officers: President, C. A. Webb, of Warren; treasurer, G. D. Gould, of Warren.

NEW HAVEN, CONN.—A special meeting of the Southern New England Telephone Company will be held November 1 at 2 p. m., to accept an amendment to the charter of the company permitting an increase in the directorate from nine to fifteen members.

SULLIVAN, IND.—The Sullivan Independent Telephone Company has purchased and taken over all the property and holdings of the Bell Telephone Company in this city and county and will combine the two systems. The consideration is reported to have been $100,000. S.

FORT WAYNE, IND—The Home Independent Telephone Company has made a number of contracts to install private branch exchanges on its system. The manufacturers and other concerns are realizing the advantages to be gained by having private branch exchange connections. S.

SAN FRANCISCO, CAL.—The Home Long-Distance Telephone Company has been incorporated in San Francisco, with a capital stock of $10,000,000, of which $300,000 is paid in by L. S. Beedy, A. S. Keeler, Jas. Lanagan, H. G. Holobird, A. Coxhead, Guy Knupp and J. E. O'Brien. The company plans stretching long-distance telephone lines from the northern to the southern boundaries of the state.

TOLEDO, OHIO—An amended bill was last week filed at Toledo in the United States Circuit Court, in the big telephone controversy which has been waged relentlessly for some time by the United States Telephone Company against the Central Union Telephone Company and the American Telegraph and Telephone Company. The amendment was filed by permission of Judge Taylor, who last May gave a decision against the plaintiff, on the ground that the telephone business was a simple one and that 99-year contracts could not be enforced. The new pleading sets up all the former argument, and in addition alleges that the

business is more complicated than the express or railway business, both of which have made long-time contracts which were upheld by the courts.

ALBANY, N. Y.—The stockholders of the Independent Union Telephone Company, of this city, which controls the independent toll exchanges in this section here, authorized the directors to sell their assets and long-distance service. It is understood they will be purchased by a new company to be incorporated at an early date and which plans to control the long-distance service of all independent companies in the country.

WORCESTER, MASS.—The large new car manufacturing plant of Osgood Bradley & Sons will be built in Greendale. Approximately fifty-two acres of land situated on the Boston & Maine tracks between Brooks and Mountain streets have been conveyed to John E. Bradley. On this land Mr. Bradley will build one of the greatest car manufacturing plants in the East, and employ about 1,000 men. It means an expenditure of $500,000.

RICHMOND, VA.—An important announcement is made to the effect that the Atlantic Coast Line Railway will experiment with the telephone over a route from this city to Rocky Mount, N. C., the telephones to be used exclusively in the operation of trains. The Richmond, Fredericksburg & Potomac Railway is also said to be watching the experiment of the Coast Line, with a view to adopting such a system if feasible. This is perhaps the first attempt in North Carolina to operate trains by telephone. There will also be service between moving trains and all stations on the route. L.

DES MOINES, IOWA—The Iowa Telephone Company, by its vice-president and general manager, George E. McFarland, announces the purchase of the Mutual Telephone Company of Des Moines, by securing possession of the majority of stock held by Charles and Clyde E. Brenton, bankers, of Dallas Center, Iowa. The deal was negotiated by Casper E. Yost, president of the Nebraska Telephone Company, who owns a controlling interest in the Iowa Telephone Company. The price paid for the controlling interest only was $600,000. The value of all property owned by the Mutual company is $1,100,000. The company was capitalized at $1,600,000 in 1896.

INDIANAPOLIS, IND.—The Indianapolis and the New Telephone companies have brought suit against A. W. Hatch and the Federal Union Surety Company to recover $20,000 in damages. The suit grows out of the injunction proceedings brought by Hatch to enjoin the city from granting the companies a new franchise. The Surety Company furnished the bond for Hatch when several changes of venue were taken. The companies won and secured the franchise, but the cost of the litigation, appraisements, etc., cost complainants the sum they seek to recover. The attorneys for Hatch admitted that the Bell Telephone Company was back of the injunction suit. S.

ALBANY, N. Y.—The largest mortgage ever registered in Westchester County, if not in New York state, was turned over to Registrar Edward B. Kear in the Court House last week. The amount involved is $75,000,000 and the mortgage is given by the New York Telephone Company to the Farmers' Loan and Trust Company and John H. Parsons, of Montclair, N. J., as trustees. The mortgage covers many printed pages and is considered one of the most remarkable documents of its kind that has ever been filed in the Westchester County Registrar's office. The total amount of the mortgage tax which the New York Telephone Company will pay the state of New York is $125,000. The mortgage is registered in Westchester and New York counties simultaneously.

GRAND RAPIDS, MICH.—The stockholders of the Citizens' Telephone Company have authorized an increase in capitalization from $3,500,000 to $5,000,000. This is to provide for the expansion movement which has been carried on for years past, and which is being continued. The reports of Secretary E. B. Fisher and General Manager Tarte were received with favor by the stockholders. The former board of directors was returned and is: Charles F. Rood, Edward Fitzgerald, E. B. Fisher, W. J. Stuart, Philip Graham, John B. Martin, Cyrus E. Perkins, Robert D. Graham, J. B. Ware, L. J. Rindge and G. W. Perkins. The board of directors has re-elected the following officers: C. F. Rood, president; Edward Fitzgerald, vice-president; E. B. Fisher, secretary; W. J. Stuart, treasurer.

OBITUARY.

WILLIAM I. BUCHANAN, of Buffalo, N. Y., former American minister to the Argentine Republic and Panama, met a tragic death in London on October 17. Mr. Buchanan, who was in London on a mission for the United States government in connection with the Venezuelan claims, was at one time prominently connected with the General Electric and Westinghouse interests. He had held many important diplomatic posts, having been United States minister to the Argentine Republic and the first United States minister to Panama. While serving in the former capacity, Mr. Buchanan was instrumental in settling the boundary dispute between the Argentine Republic and Chile.

ELECTRICAL SECURITIES.

The tendency in the security market is somewhat inclined to be downwards on account of the tightness of money. Reiteration will not make this feature any more than the stereotyped habit at this time of year. Returns, however, from the leading electrical companies show that business is improving right along. Most of them are getting back to where they were, and many of them are doing a great deal better. Financial reports of industrial corporations will repay perusal.

The Chicago Railways Company's annual meeting will take place on October 28.

The Commonwealth Edison's net income for September was the largest in the company's history.

The New York Stock Exchange has received notice from the Philadelphia Company of the increase of $5,000,000 in its common stock.

The North Shore Electric Company, of Chicago, will issue $400,000 new stock to shareholders at par. Since organization in 1902 the capitalization has been increased from $1,000,000 to $4,000,000, improvements and extensions being capitalized instead of bonded. Samuel Insull is president of the company, which is controlled by the Commonwealth Edison interests.

The Boston Suburban Electric Companies will receive tenders of the stock for cancelation until 3 p. m. October 27 at the Boston Safe Deposit and Trust Company. The tenders will be opened October 28, and will be acted upon not later than 2 p. m. November 5. In a circular to the stockholders the treasurer says that the trustees are ready to expend cash to an amount not exceeding $600,000, and to issue notes of the trust to an aggregate amount not exceeding $2,000,000, for the acquisition of preferred and common shares upon terms deemed advantageous to the trust, the number of common shares acquired not to exceed the number of preferred shares. The notes will be four per cent ten-year coupon, dated December 1, 1909, with interest payable semi-annually.

The governing committee of the New York Stock Exchange has listed the following securities: United Railways Company of St. Louis, $1,500,000 additional first general mortgage four per cent bonds, due 1934; Michigan State Telephone Company, $300,000 additional first mortgage twenty-year five per cent bonds, due 1924; Westinghouse Electric and Manufacturing Company, $2,720,000 ten-year five per cent collateral notes, due 1917; Keystone Telephone Company, of Philadelphia, $1,045,000 additional first mortgage five per cent thirty-year bonds, due 1935.

The Central District Telegraph Company advises its stockholders that after October 15 and before November 15 stock of the Central District Company may be exchanged for shares of American Telephone, on the basis of fifteen shares of American for sixteen shares of Central District stock. The privilege of exchange will expire November 15.

DIVIDENDS.

Havana Electric Railway; quarterly dividends of $1 on the common and $1.50 on the preferred stock, payable November 13.

Michigan State Telephone Company; quarterly dividend of one-and-one-half per cent on its common stock, payable December 1 to stockholders of record November 15; also quarterly dividend of one-and-one-half per cent on its preferred stock, payable November 1 to stockholders of record October 18.

Milwaukee Electric Railway and Light Company; regular quarterly dividend of one-and-one-half per cent upon preferred capital stock, payable on November 1 to all stockholders of record at the close of business on October 20.

Minneapolis General Electric Company; dividend rate on the $1,500,000 common stock increased from four to six per cent and quarterly dividend of one-and-one-half per cent declared, payable November 1 to stockholders of record October 22.

Railways Company General; quarterly dividend of one per cent, payable November 1. This is the initial dividend on a regular dividend period basis.

The Rio de Janeiro Tramway, Light and Power Company; first quarterly dividend of one per cent, payable November 1.

NEW YORK.

	Oct. 18.	Oct. 11.
Allis-Chalmers common	14¾	14½
Allis-Chalmers preferred	52	52½
Amalgamated Copper	83⅛	81⅛
American Tel. & Cable	*80	*80
American Tel. & Tel.	142	142½
Brooklyn Rapid Transit	78	78½
General Electric	163½	164
Interborough-Metropolitan common	16½	15½
Interborough-Metropolitan preferred	48⅝	47½
Kings County Electric	128	128
Mackay Companies (Postal Telegraph and Cables) common	92⅝	91⅝
Mackay Companies (Postal Telegraph and Cables) preferred	74	73
Manhattan Elevated	141	142
Metropolitan Street Railway	20	20
New York & New Jersey Telephone	123½	123½
U. S. Steel common	91⅞	87⅛
U. S. Steel preferred	128⅝	127
Western Union	78	76½
Westinghouse common	86½	86
Westinghouse preferred	140	138

*Last price quoted.

BOSTON.

	Oct. 18.	Oct. 11.
American Tel. & Tel.	142	142½
Edison Elec. Illuminating	248	252
General Electric	163½	164
Massachusetts Electric common	17½	17
Massachusetts Electric preferred	81	80½
New England Telephone	136	135
Western Tel. & Tel. common	10½	10¾
Western Tel. & Tel. preferred	88	89

PHILADELPHIA.

	Oct. 18.	Oct. 11.
American Railways	45¼	46
Electric Company of America	12⅞	12½
Electric Storage Battery common	59½	59½
Electric Storage Battery preferred	59½	59½
Philadelphia Electric	13¼	12½
Philadelphia Rapid Transit	28	28
Philadelphia Traction	88¾	90
Union Traction	53¼	53¼

CHICAGO.

	Oct. 18.	Oct. 11.
Chicago Railways, Series 1	106	108
Chicago Railways, Series 2	35½	36
Chicago Subway	7¾	5¾
Chicago Telephone	136	.....
Commonwealth Edison	120	120
Metropolitan Elevated common	16	15½
Metropolitan Elevated preferred	52½	50½
National Carbon common	99	97
National Carbon preferred	118	118

PERSONAL MENTION.

MAYOR FRED A. BUSSE, of Chicago, Ill., has been making a practical study of the electrification of steam-railway terminals in New York city during the past ten days, having gone to New York for the purpose of verifying the various reports and figures submitted to him in Chicago.

L. G. KIBBE has resigned as treasurer of the Wheeler Condenser and Engineering Company, of Carteret, N. J., in order to take an active part in the management of the Warren Steam Pump Company, of Warren, Mass. Mr. Kibbe will be located at the head offices of the latter company at Warren.

HENRY MANSON BYLLESBY, who, as announced briefly in last week's issue, has been elected president of the Chicago Civic Federation and chairman of its executive committee, is one of the leading consulting engineers of the Central West. He was born in Pittsburg close to fifty years ago and is a graduate of the engineering courses at Lehigh University. His technical experience has been quite varied and has extended to the experimental, operating and manufacturing branches of the electrical industry as well as to strictly designing engineering. In the early days of the electric-lighting business he was associated with Thomas A. Edison. Later he was connected with the old Thomson-Houston Company and then with the Westinghouse Electric and Manufacturing Company, of which he was at one time vice-president. He also had considerable to do with the British Westinghouse Company. Several years ago he established the now well-known consulting engineering firm of H. M. Byllesby & Company, of which he is president. Mr. Byllesby is a member of the American Institute of Electrical Engineers, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the Western Society of Engineers, and many other similar organizations, as well as civic bodies and clubs. As president of the Chicago Civic Federation he will direct into the most useful channels the great influence of this organization for the political and moral uplift of the city.

NEW PUBLICATIONS.

INDUSTRIAL PROGRESS—The monthly, "Industrial Progress," published in Milwaukee, Wis., for October contains a number of interesting articles, including "The New Steam Turbine Plant of the Linoleum Company," "An Electrically Driven Copper Mill," "The Treatment of Steel in Electric Furnaces," "Electricity in Steel Mills," etc.

MINES AND METHODS—A new monthly, called "Mines and Methods," has made its initial appearance with the September number. It is edited and published by Claude T. Rice, and the publication office is in the Tribune Building, Salt Lake City, Utah. This new paper has a number of very good articles descriptive of mining and smelting installations and methods in vogue in the great mining country of which Salt Lake City is the natural center. These articles are written by practical men, who have had actual experience in this work. A novel feature of this publication is that in its initial issue it carries no advertising whatever.

PAPERS BY PROF. C. A. ADAMS—A number of papers, of which Prof. Comfort A. Adams, of Harvard University, was author, or joint author, have been reprinted in convenient pamphlet form from the Proceedings of the American Institute of Electrical Engineers. These include the following: "Voltage Ratio in Synchronous Converters with Special Reference to the Split-Pole Converter," "Electromotive-Force Wave-Shape in Alternators," "Pole-Face Losses."

TERRESTRIAL MAGNETISM AND ATMOSPHERIC ELECTRICITY—The September number of the quarterly journal of "Terrestrial Magnetism and Atmospheric Electricity" contains a continuation of the article by Paul T. Passalskij on "The Distribution of Magnetism Over the Earth's Surface." Three very interesting and illustrated articles relating to the launching, departure and other features of the new magnetic survey ship "Carnegie" are also included.

CALIFORNIA JOURNAL OF TECHNOLOGY—The monthly publication of the students of the College of Applied Science at the University of California for the month of September contains an account of the work done by the summer school of engineering, articles on the "Strength of Compression Members," "Increased Size of Motive Power for Railroads," "Non-inflammable Substances," "The Relation of the Character of Coals to the Prevention of Smoke," and other interesting topics.

PUBLIC SCHOOL LECTURES, NEW YORK CITY—The Department of Education of the city of New York has issued in pamphlet form its announcement of public lectures that are to be given this season in about eighty lecture centers, located principally in the public schools in the boroughs of Manhattan and the Bronx. The subjects comprise a great many topics in literature, history, biography, economics and civil government, fine arts, astronomy, physics, electricity, chemistry, geology, biology and other sciences, various industries and descriptive geography.

INDUSTRIAL ITEMS.

THE SUNRAY ELECTRIC LAMP MANUFACTURING COMPANY, 109 West Forty-second Street, New York, N. Y., manufacturer of the well-known Sunray electric lamp, is distributing a booklet which reviews the history of the electric lamp, describes the Sunray lamps in detail and contains much valuable technical information regarding electric lamps in general.

THE NEW PROCESS RAW HIDE COMPANY, of Syracuse, N. Y., has prepared a catalogue describing its New Process noiseless pinions and the advantages resulting from their use. Among the good points that have been found by the many users of these pinions are the freedom from noise, excellent wearing qualities, reduction of vibration, and ability to mesh accurately with metal gears formerly used. These and other points have justified the company in speaking of these pinions as the ideal motor drive.

THE UNIVERSAL MANUFACTURING COMPANY, Chicago, Ill., manufacturer of the Universal flat-rate controller, held its annual meeting last week. A. C. Kraft was re-elected president of the company, and Thomas P. Evans was re-elected treasurer. F. Kirchhoff was elected vice-president, and William C. Gohde, secretary. The above gentlemen, with A. Pophal, J. L. Adams and Charles H. Menzel, constitute the board of directors. The Universal company is about to begin an active campaign to bring its controller to the attention of every possible user. The company anticipates a large business within the next few months. Its product has been adopted by a great many lighting companies all over the country.

THE KELMAN ELECTRIC AND MANUFACTURING COMPANY, Los Angeles, Cal., and PIERSON, ROEDING & COMPANY, San Francisco, have completed arrangements whereby the latter firm acquires the Pacific coast agency for the Kelman high-voltage oil switches and circuit-breakers. This company has branch offices in Los Angeles and Seattle, the latter office especially covering a large territory, which includes Oregon and Washington, as well as British Columbia and Alaska, and is particularly well qualified to handle this line, having already secured several large orders. In view of the extensive power developments now under way and projected, it is believed this arrangement has been made at an opportune time for increasing the sales of this well-known apparatus.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia, Pa., had an attractive exhibit of its various types of storage batteries used in signal work at the annual convention of the Railway Signal Association, conspicuous among which was its 7-S "Exide" type, of which 40,000 are in use for automatic rock signal work on the Harriman lines, and its Missouri Pacific type of portable "Exide" batteries, consisting of five cells 7-SS installed in one box. Among the "Chloride" accumulator types, this company exhibited cells of D-5, complete in glass jars E-7, and their various couple types, BT, CT, ET and PT. The company was represented by Godfrey H. Atkin, manager of the Chicago office; H. H. Beck, operating engineer, Chicago, and R. I. Baird, of Chicago, and Chas. W. Terry, of Cleveland.

DATES AHEAD.

Western Association of Electrical Inspectors. Annual meeting, Detroit, Mich., October 26, 27 and 28.

Illinois State Electric Association. Annual meeting at Alton, Ill., October 26, 27 and 28.

American Electrochemical Society. Next meeting, New York city, October 28-30.

National District Heating Association. First annual meeting, Columbus, Ohio, November 10 and 11.

Alabama Light and Traction Association. Annual convention, Birmingham, Ala., November 15 and 16.

American Association of Electric Motor Manufacturers. Next meeting, St. Louis, Mo., November 15 to 18.

Boston Electrical Show. Mechanics' Building, Boston, November 15-25.

Empire State Gas and Electric Association. Annual convention, New York city, November 17 and 18.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Lima, Ohio, November 19 and 20.

International Independent Telephone Association. Annual convention, Chicago, December 7, 8 and 9.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) October 12, 1909.

936,283. DWARF RAILWAY SEMAPHORE-SIGNAL. Harry M. Abernethy, Cleveland, Ohio. Filed December 31, 1906. The semaphore blade is unlocked and moved in one direction, electrically, the blade being moved in the opposite direction by gravity.

936,284. FRICTION-CLUTCH ELECTRIC CONTROL. Harry M. Abernethy, Cleveland, Ohio. Filed April, 1908. A non-revoluble armature surrounding an independent shaft (alined with a revoluble shaft carrying a clutch member) is adapted to be attracted by a stationary magnet coil surrounding the clutch member.

936,292. INDUCTION-MOTOR. Sven R. Bergman, Lynn, Mass., assignor to General Electric Company. Filed March 22, 1909. The starting device for a squirrel-cage motor comprises means for varying the reactance of an end ring of the secondary winding.

936,304. TRANSMISSION OF ELECTRICAL POWER. Charles M. Chisholm, Marysville, New Brunswick, Canada. Filed January 9, 1908. Tuning forks at a transmission station are each caused to vibrate for a predetermined time period, and an electric circuit is controlled by a microphonic element common to all the forks and actuated by them, so as to influence a distant receiving apparatus having means tuned to a characteristic frequency.

936,305. ELECTRIC ARC LIGHT. Frederick P. Cobham, Jamestown, N. Y., assignor of one-third to Fred E. Windsor and one-third to Lewis Schmutz, Warren, Pa. Filed January 10, 1908. The magnet coil for actuating the movable carbon has within it a movable core piece comprising an inner casing of magnetic material and an outer casing of non-magnetic material, and between the creasings finely divided pieces of magnetic material.

936,325. MEANS FOR CONTROLLING THE MOVEMENT OF RAILWAY VEHICLES. John H. Just, Syracuse, N. Y. Filed February 3, 1908. A valve in the inlet passage for the motive fluid of the brake system is controlled by an electromagnet which in turn is operated from the road bed.

936,329. ELECTRICALLY-OPERATED AUTOMATIC SWITCH. William A. Lacke, Chicago, Ill. Filed May 29, 1908. Describes a form of compound electric switch.

936,340. TROLLEY-CLIP. John C. Michaelson, Charleston, W. Va. Filed July 2, 1908. Describes a clamp for trolley wires.

936,341. TROLLEY. George G. Miller, Baltimore, Md. Filed November 3, 1908. Has a device extending over the trolley wire to hold the trolley wheel in engagement therewith.

936,360. INDUCTION-MOTOR. Conway Robinson, Schenectady, N. Y., assignor to General Electric Company. Filed February 14, 1906. A starting switch for an induction motor and acting by the centrifugal force of a conducting fluid in a rotary casing operates by short-circuiting the rotor conductors.

936,370. HANGER FOR WIRES. Frank L. Sessions, Columbus, Ohio, assignor to the Jeffrey Manufacturing Company. Filed July 17, 1902. Describes an insulating hanger for electric wires or the like.

936,373. SELECTIVE RINGING-KEY. Charles A. Simpson, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company. Filed June 8, 1905. Describes a form of selective calling device for telephone switchboards.

936,374. TELEPHONE TRUNKING SYSTEM. Charles A. Simpson, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company. Filed March 18, 1907. A trunk for connecting telephone lines of different switchboards terminates in a plug and a jack at each end. Associated with the plug at each end is a signal and means are provided for displaying one of the signals whenever a connection is established with the jack at its end of the trunk.

936,379. ADJUSTABLE LAMP-BRACKET. Charles E. Stevens, South Bend, Ind., assignor of one-third to George W. Loughman and one-third to James H. Loughman, South Bend, Ind. Filed March 5, 1909. The normally vertical standard consists in effect of a number of ball-and-socket joints held in contact by a spring, so that it may be bent into any convenient position and remain so.

936,403. PROCESS OF MAKING FILAMENTS FOR ELECTRIC INCANDESCENT LAMPS. Werner von Bolton, Charlottenburg, Germany, assignor to Siemens & Halske, A. G., Berlin, Germany. Filed October 2, 1906. Refractory metal powder is inserted into a tube of ductile material and the tube is then worked into filamentary form. Finally the tube is removed.

936,405. WIRELESS RAILWAY SIGNAL SYSTEM. Edward R. Brodton, Mobile, Ala., assignor of thirteen-thirtieths to George H. Fonde and thirteen-thirtieths to Ernest E. Wagar, Mobile, Ala. Filed June 29, 1908. Groups of two or more overlapping trains of electric waves operate respective receivers which in turn control circuits inter-related to each other.

936,421. SHADE-HOLDER. John H. Dale, New York, N. Y. Filed August 26, 1908. The frusto-conical shade for an electric lamp is gripped at its upper (smaller) end by the spring tongue sections (constricted by a spring wire) of the holder.

936,432. TELEPHONE. Henry Eccles, Laclede, Mo., assignor to Samuel L. Van Akin, Jr., Syracuse, N. Y. Filed March 21, 1907. Describes a form of stand for a telephone transmitter and receiver.

936,443. TRAIN-CONTROLLING MECHANISM. Orlando Gibson, Hollidaysburg, Pa., assignor of one-fourth to C. H. Glazier, Huntingdon, Pa., fifty-five one-hundredths to C. E. Foster, Pittsburg, Pa., and twenty one-hundredths to William S. Taylor, Huntingdon, Pa. Filed April 5, 1909. A lever on the train for applying the air brakes can be tripped by an electrically operated device in the track.

936,463. CLUSTER LAMP-SOCKET. Herman J. S. Lewis, New York, N. Y., assignor to John H. Dale, New York, N. Y. Filed May 27, 1908. A transversely divided insulating ring, with threaded shells secured thereto, is provided with means between its sections affording center contacts around the outside periphery of the ring.

936,472. MECHANICAL ARRANGEMENT FOR ELECTROPLATING OBJECTS. Wilhelm Pfanhhauser, Leipzig, Germany. Filed June 18, 1909. The electrolyte is applied to the material by a mechanism connected with one pole of a circuit and connected with the other pole are means for moving the material with respect to the mechanism.

936,488. SYSTEM AND DEVICE FOR INDICATING TRAIN MANIPULATION. Lewis B. Stillwell, Lakewood, N. J. Filed February 3, 1906. A device indicates the time occupied in braking the (electric) train, and a switch automatically actuating this device is closed by the air operating the air-brake mechanism.

936,490. TELEGRAPHONE. Harve R. Stuart, Wheeling, W. Va., assignor to American Telegraphone Company, a corporation of the District of Columbia. Filed March 21, 1908. Two magnets simultaneously move relatively to the recording disk, on the same side of it but on opposite sides of its center, one magnet from a position on the disk of high speed toward a position of low speed, and the other vice versa.

936,495. TELEPHONE SYSTEM. Frank C. Unger, St. Louis, Mo. Filed October 22, 1908. "Central" is notified by means (under the control of a subscriber) causing a circuit to pass through an alternating-current ringing machine and line drop.

936,499. ASEPTIC DEFLECTOR-LAMP. George C. Werner, New York, N. Y. Filed April 11, 1907. A long narrow battery in a suitable casing is connected by wires to a holder having an

electric lamp at one end and containing a rheostat operated by a revolvable plug.

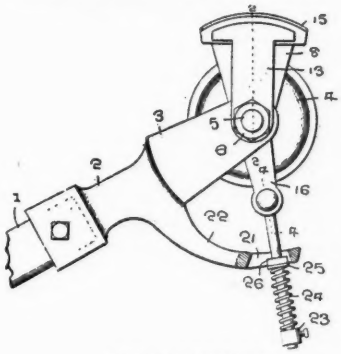
936,503. MAGNETIC REGULATOR FOR AUDIPHONE-RECEIVERS. Charles E. Williams, Natick, Mass. Filed January 4, 1908. An audiphone receiver is regulated by moving a soft iron screw toward or away from the other core of the electromagnet which co-operates with the diaphragm of the receiver.

936,507. SPARK-PLUG. James C. Anderson, Washington, D. C. Filed March 20, 1909. The plug has a central movable electrode and the other electrode is comprised of the inner end of the shell which is turned in at an angle to its axis.

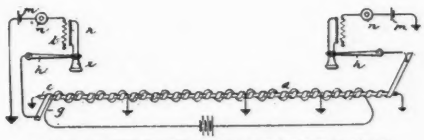
936,512. CLUSTER LAMP-SOCKET. Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Manufacturing Company. Filed April 14, 1904. The bowl-shaped metallic casing has circularly arranged openings and encloses the electrical conducting parts of the cluster.

936,518. TURN-KEY FOR LIGHT-FIXTURES. Robert M. Bryce, Indianapolis, Ind. Filed December 31, 1907. The clasp member is formed of a strip of thin metal bent into shape to furnish engaging side walls.

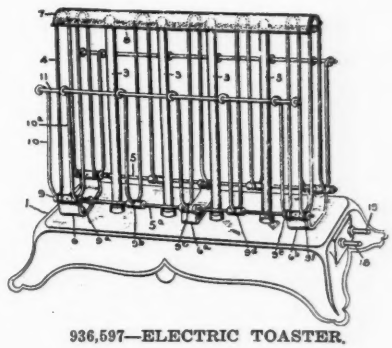
936,530. PERMANENT MAGNETIC METAL. Samuel E. Gertler, New York, N. Y., assignor to Charles F. Splitdorf, New York, N. Y. Filed March 9, 1909. Comprises tungsten (5.25 per cent), carbon (0.65 per cent), silicon (0.15), manganese (0.25), chromium (0.20), sulphur and phosphorus (0.02 per cent or less), aluminum (2.50), and the rest iron.



936,341—TROLLEY.



936,538—CIRCUIT FOR PROPAGATING WAVE-FORMS.



936,597—ELECTRIC TOASTER.

936,538. CIRCUIT FOR PROPAGATING WAVE-FORMS. Dugald C. Jackson, Madison, Wis. Filed September 23, 1901. A wave-conducting circuit comprises a conductor and a magnetic core about which the latter is disposed to produce inductance to counteract capacity. The core is included in the circuit and means are provided to increase the inductance.

936,556. ELECTRIC LAUNDRY-IRON. Harry C. Newman, Los Angeles, Cal., assignor of fifty-one one-hundredths to J. J. Jenkins, Los Angeles, Cal. Filed July 20, 1908. The heating element comprises a coiled wire with suitable coil spacers.

936,564. TIMER FOR IGNITERS OR SPARKERS. Harrry Rose, Three Rivers, Mich., assignor to Sheffield Car Company, Three Rivers, Mich. Filed June 18, 1908. The operating shaft carries a brush holder within a contact holder.

936,577. ELECTRICAL CONTROLLING MEANS FOR PLANERS AND OTHER MACHINES. Abram P. Steckel, New York, N. Y. Filed February 10, 1909. Electrical means are provided for controlling a motor and also transmission devices operated by the motor but oppositely to it.

936,578. ELECTRIC CIRCUIT INTERRUPTER. Harve R. Stuart, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed January 24, 1906. The air gap between core members is adjustable.

936,584. ELECTRIC CIRCUIT CONTROLLER AND INTERRUPTER. Curtis A. Tucker, Edgewood Park, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed January 3, 1906. The movable contact member of a double-throw switch is automatically returned to mid position under predetermined conditions by a pair of pivoted, spring-connected dogs.

936,594. ELECTRIC CIRCUIT-BREAKER. Christian Aalborg, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed May 2, 1906. A bracket pivoted to a movable flexible contact-member engaging with stationary circuit terminals, may be adjusted and fixed in position with reference to the contact-member.

936,597. ELECTRIC TOASTER. William S. Andrews, Schenectady, N. Y., assignor to General Electric Company. Filed November 21, 1908. A number of heaters operating at a radiant heat are surrounded by an openwork support for the material to be toasted.

936,601. SWITCH. Clarence Carson, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed December 27, 1906. Describes a form of pendant switch.

936,615. ALTERNATING-CURRENT MOTOR. Friedrich Eichberg, Berlin, Germany, assignor to General Electric Company. Filed April 19, 1907. Has two sets of brushes displaced at an angle of ninety degrees, the first set for short-circuiting the rotor winding on the line of magnetization of the inducing winding (on the stator), connections for impressing a constant voltage on the rotor winding between one brush of the second set and the short-circuiting brush, and means for supplying to the rotor winding through another brush of the second set and the short-circuiting brushes a current proportional to the current in the inducing winding.

936,622. COIL-SUPPORT. Israel L. Griffith, Pittsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed January 10, 1908. A coil support for electrical apparatus has an L-shaped body member, a removable side member and clamping bolt through corresponding ends of these members.

936,639. MOLDING FOR ELECTRIC WIRING. William H. G. Kirkpatrick, Philadelphia, Pa. Filed October 27, 1908. A longitudinal wire-receiving groove has at intervals retaining portions for the wire, projecting within it.

936,648. ROCKING SOLENOID-SWITCH. Albert T. Marshall, Hartford, Conn., assignor to the Automatic Refrigerating Company. Filed October 1, 1908. Each of two circuits, controlled by a thermostat arm, energizes the solenoid to shift the solenoid core to either side.

936,656. ELECTRICAL DISCHARGE APPARATUS. Newitt J. Neall, Pittsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed January 24, 1906. A block composed of electrical conducting bodies has individual coatings of insulating material and is bound together by other insulating material in which they are embedded.

936,666. SWITCHING DEVICE. Otto Rennert, London, England. Filed January 12, 1903. Two circuits in parallel, with conductors common to both and connected to a battery (included in one of these conductors being a manually operated circuit-closing device), are associated with a bell and annunciator magnet, the latter coacting with an armature lever arranged to hold a switch lever in one position to close contact springs, etc.

936,669. ELECTRICAL COIL. Maurice C. Rypinski, Pittsburg, Pa., assigner, by mesne assignments, to Westinghouse Electric and Manufacturing Company. Filed November 18, 1907. Two disks at one end of a cylindrical coil of wire have radial slits and projections at the sides of the slits for connecting to terminals of the coil and to an external circuit.

936,682. MOTOR-CYCLE RAILWAY SYSTEM. James N. Vandegrift, Bryn Mawr, Pa. Filed March 9, 1905. The device described has an armature and a surrounding field comprising an outer field-magnet-supporting portion, an end integral therewith and an end separable therefrom, the line of separation being waved.

936,684. RECEIVING SYSTEM FOR HIGH-FREQUENCY ELECTRICAL OSCILLATIONS. Frederick K. Vreeland, Montclair, N. J., assignor to Wireless Telegraph Exploitation Company. Filed November 4, 1905. Dissimilar coils are wound in close inductive relation and connected in parallel and in the same sense in a circuit traversed by the oscillations, a support for the coils permits their relative movement, and a diaphragm effected by such relative movement of the coils produces audible signals.

936,692. COMMUTATOR-BRUSH. Vincent G. Apple, Dayton, Ohio. Filed July 7, 1906. Carbon blocks, crenelated on one side to fit together, are joined together on opposite sides of a thin metal separating strip of similar crenelated outline to form a composite block of rectangular section.

936,724. ELECTROMAGNETIC SWITCH. John D. Ihlder, New York, N. Y., assignor to Otis Elevator Company. Filed October 11, 1907. Comprises an electromagnet, switch arms, stationary contacts, a combined lock and pivot shaft for the switch arms, and a locking key for the stationary contacts.

936,775. ELECTRIC SWITCH. Harold D. Grinnell, New Bedford, Mass. Original application filed March 21, 1908. Divided and this application filed March 23, 1909. An internal gear-wheel fixed on the switchboard comprises alternately insulated and contact-making sections, and a manually controlled switch shaft has on it an arm carrying a pinion in mesh with the gear-wheel.

936,840. ELECTRIC INSULATOR. John A. Wells, Detroit, Mich. Filed April 12, 1909. An annular insulating joint has a flange member at one extremity.

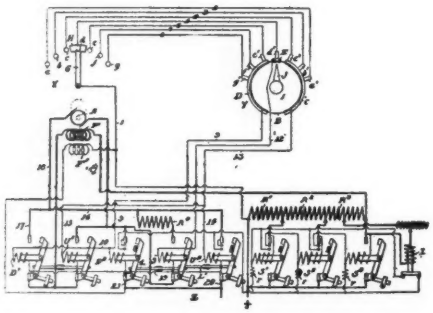
936,847. COMBINATION HARNESS AND WARP STOP-MOTION. Henry Anner and Michael J. Marnel, Phillipsburg, N. J. Filed December 19, 1908. Describes an electric stop-motion for looms.

936,849. PRINTING-TELEGRAPH. John C. Barclay, New York, N. Y. Filed April 3, 1907. Character members operating printing means are controlled by selector bars provided with electromagnetic restoring means.

936,869. ELECTRIC-LIGHT BRACKET. Ernest I. Drent, New Orleans, La. Filed February 20, 1909. A bulb socket is mounted between the spaced extensions of the body.

936,870. ELECTRICAL DRILL. William O. Duntley, Chicago, Ill., and Henry J. Kimman, Cleveland, Ohio, assignors to Chicago Pneumatic Tool Company. Filed May 3, 1905. An electric motor operates the drill through a planetary gear.

936,871. METHOD OF PREPARING MOLDS FOR ELECTROTYPES. George E. Dunton, New York, N. Y. Filed March 3, 1909. The formed, cooled mold has its surface first shaved, and then polished with a heated device.



936,878—AUTOMATIC CONTROLLER.

936,878. AUTOMATIC CONTROLLER. Frederick R. Fishback, Cleveland, Ohio, assignor to the Electric Controller and Manufacturing Company. Filed January 23, 1909. An electric motor drives a switch member having a series of fixed contacts co-operating with it, and a setting switch has fixed contacts corresponding to the first-named fixed contacts. A braking switch is provided for connecting the motor armature in a closed braking circuit, and a contact on the setting switch for governing the braking switch.

936,914. ELECTRIC ALARM FOR INCUBATORS. Charles L. Kulp, Sunbury, Pa., assignor of one-third to David Howerter, Sunbury, Pa. Filed March 3, 1909. A battery and alarm in an electric circuit are associated with a trip arm and contact block, the trip arm being located in the path of a damper-controlling lever.

936,948. SHOE-BRUSHING MACHINE. George E. Russell, Longbeach, Cal. Filed October 21, 1908. An electric motor drives the brush through a flexible shaft.

936,950. CHRONOMETRIC ELECTRICAL SWITCH. Joseph L. Scheuble, St. Louis, Mo. Filed April 16, 1909. Comprises a motor-driven rotary clamp engaging the key of a rotary snap-switch, and a rotary contact-arm (revolved by a clock movement) provided at its extremity with a U-shaped contact spring which contacts with an adjustable contact post (seated at the base of one of the ratchets on a dial mounted on the clock movement) to close the motor circuit.

936,952. CONTROLLER FOR ELECTRIC MOTORS. Oscar F. Shepard, Jr., Cincinnati, Ohio, assignor to the Warner Elevator Manufacturing Company. Filed January 15, 1906. The controller comprises resistance sections having circuit connections, magnetic devices insertable in a circuit of the motor to be controlled and controlling the circuit connections of the respective resistance sections, and a number of retarding means, one for each of the magnetic devices, for timing the operation thereof.

936,993. ELECTRIC WATER-PURIFIER. Mathew R. Frei, Kansas City, Mo. Filed May 1, 1909. An electrolyzing chamber with suitable electrodes is associated with a water filter.

937,018. SYSTEM OF ELECTRICAL DISTRIBUTION. Frank G. Beetem, Philadelphia, Pa., assignor to the Electric Storage Battery Company. Filed February 12, 1908. In combination an electric circuit is a storage battery in operative relation thereto, also an armature having an appropriate commutator and field structure, two sets of brushes bearing upon the commutator whereof one set is electrically interconnected and the other set is provided with connections for controlling the current from the storage battery, a winding on the field structure adapted to produce a magnetic field and an electromotive-force across the interconnected brushes, and a regulator for controlling the current in the winding and arranged to respond positively to the load on the circuit.

937,032. PRINTING-TELEGRAPH. John C. Barclay, New York, N. Y. Filed September 21, 1908. A telegraph printer comprises a rotary type wheel, rotating and controlling means for this comprising an escapement wheel in mechanical driving connection with the type wheel, an escapement anchor and a magnet for operating the same, a movable carriage, a carriage escapement controlling motion thereof and comprising a controlling magnet, and control means for the magnets adapted for complete operation by current alternations of one strength.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired October 18, 1909:

484,386. ELECTRIC FIRE ALARM. Joaquin J. D'Almeida and Jose Y. Da Silva, Lisbon, Portugal.

484,416. APPARATUS FOR REFINING METALS BY ELECTRICITY. Charles R. Fletcher, Boston, Mass.

484,449. LANTERN FOR ELECTRIC LIGHTING. Daniel S. Page, Malden, Mass., and Joseph L. Bertsch, Cambridge, Mass.

484,450. ELECTRIC LIGHT FIXTURE. Daniel S. Page, Malden, Mass.

484,466. LIGHTNING ARRESTER. Lewis Searing, Denver, Colo.

484,479. ELECTRIC LIGHTING SYSTEM. Barton B. Ward, New York, N. Y.

484,522. ELECTRODE FOR MEDICINAL PURPOSES. Edward H. McBride, Springfield, Mo.

484,530. ELECTRIC ARC LAMP. Carl Coerper, Coeln, Germany.

484,532. ELECTRICAL CURLING-IRON. Andrew D. Gardner, Lynn, Mass.

484,535. APPARATUS FOR ELECTROPLATING. Frank H. Howard, Irvington, N. J.

484,543 and 484,544. ELECTRICAL INDUCTORIUM. Lazarus S. M. Pyke and Edward S. Harris, London, England.

484,545. ELECTRIC FUSE BOX. William Stanley, Jr., and John H. Kelman, Pittsfield, Mass.

484,549. SYSTEM OF ELECTRICAL DISTRIBUTION. De Witt B. Brace, Lincoln, Neb.

484,553. ELECTRODE AND INCANDESCENT ELECTRICAL CONDUCTOR. Lewis L. Jones, Brooklyn, N. Y.

484,565. MAST ARM FOR ELECTRIC LIGHT POLES. Alonzo B. Allison and Gabriel B. Scott, Pittsburg, Pa.

484,611. REGULATOR FOR DYNAMO-ELECTRIC MACHINES. Charles E. Scribner, Chicago, Ill.

484,612. MULTIPLE-SWITCHBOARD SYSTEM. Charles E. Scribner, Chicago, Ill.

484,613. SUBSTATION APPARATUS FOR TELEPHONE SYSTEMS. Charles E. Scribner, Chicago, Ill.

484,614. ELECTRICAL RAILWAY SIGNAL. Benjamin C. Seaton, Nashville, Tenn.

484,618. ELECTRIC APPLIANCE FOR CANES. Stephen D. Smith, Milwaukee, Wis.

484,626. TELEPHONE-EXCHANGE APPARATUS. John J. Carty, New York, N. Y.

484,637. APPARATUS FOR ANNEALING WIRE OR METALLIC RODS BY ELECTRICITY. Joseph H. Hunter, Pittsburg, Pa.

484,724. ELECTRIC MOTOR OR DYNAMO. Albert W. Smith, San Francisco, Cal.

484,762. ELECTRIC BELL. John E. Thron, Philadelphia, Pa.